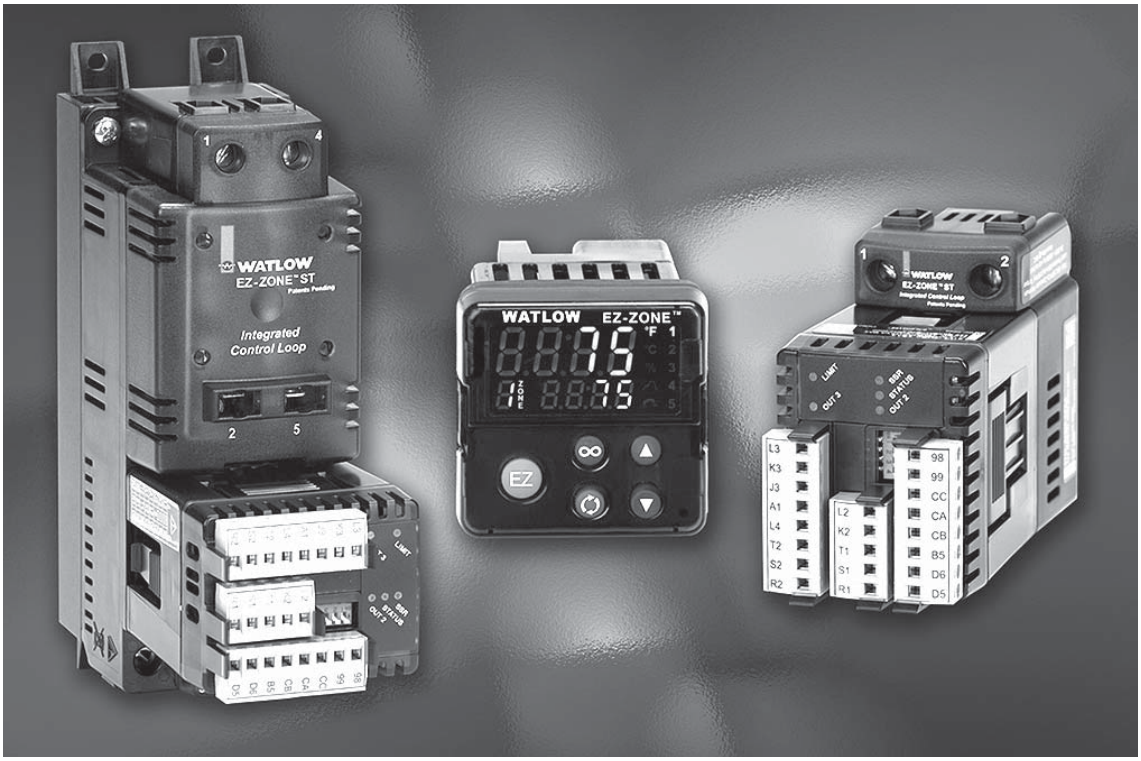
EZ-ZONE™ ST

User's Manual



Integrated Control Loop

TOTAL
CUSTOMER
SATISFACTION
3 Year Warranty

ISO 9001
Registered Company
Winona, Minnesota USA

WATLOW

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0600-0052-0000 Rev. E **Made in the U.S.A.**

October 2007 **$15.00**

Safety Information

We use note, caution and warning symbols throughout this book to draw your attention to important operational and safety information.

A “NOTE” marks a short message to alert you to an important detail.

A “CAUTION” safety alert appears with information that is important for protecting your equipment and performance. Be especially careful to read and follow all cautions that apply to your application.

A “WARNING” safety alert appears with information that is important for protecting you, others and equipment from damage. Pay very close attention to all warnings that apply to your application.

The safety alert symbol, ⚠ (an exclamation point in a triangle) precedes a general CAUTION or WARNING statement.

The electrical hazard symbol, ⚠ (a lightning bolt in a triangle) precedes an electric shock hazard CAUTION or WARNING safety statement.

CAUTION or WARNING

Electrical Shock Hazard
CAUTION or WARNING

Warranty

The EZ-ZONE™ ST is manufactured by ISO 9001-registered processes and is backed by a three-year warranty to the first purchaser for use, providing that the units have not been misapplied. Since Watlow has no control over their use, and sometimes misuse, we cannot guarantee against failure. Watlow’s obligations hereunder, at Watlow’s option, are limited to replacement, repair or refund of purchase price, and parts which upon examination prove to be defective within the warranty period specified. This warranty does not apply to damage resulting from transportation, alteration, misuse or abuse. The purchaser must use Watlow parts to maintain all listed ratings.

Technical Assistance

If you encounter a problem with your Watlow controller, review your configuration information to verify that your selections are consistent with your application: inputs, outputs, alarms, limits, etc. If the problem persists, you can get technical assistance from your local Watlow representative (see back cover), by e-mailing your questions to wintechsupport@watlow.com or by dialing +1 (507) 494-5656 between 7 a.m. and 5 p.m., Central Standard Time (CST). Ask for for an Applications Engineer. Please have the following information available when calling:

- Complete model number
- All configuration information
- User’s Manual
- Factory Page

Warranty

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Return Material Authorization (RMA)

1. Call Watlow Customer Service, (507) 454-5300, for a Return Material Authorization (RMA) number before returning any item for repair. If you do not know why the product failed, contact an Application Engineer or Product Manager. All RMA’s require:

- Ship-to address
- Bill-to address
- Contact name
- Phone number
- Method of return shipment
- Your P.O. number
- Detailed description of the problem
- Any special instructions
- Name and phone number of person returning the product.

2. Prior approval and an RMA number from the Customer Service Department is required when returning any product for credit, repair or evaluation. Make sure the RMA number is on the outside of the carton and on all paperwork returned. Ship on a Freight Prepaid basis.

3. After we receive your return, we will examine it and try to verify the reason for returning it.

4. In cases of manufacturing defect, we will enter a repair order, replacement order or issue credit for material returned. In cases of customer mis-use, we will provide repair costs and request a purchase order to proceed with the repair work.

5. To return products that are not defective, goods must be be in new condition, in the original boxes and they must be returned within 120 days of receipt. A 20 percent restocking charge is applied for all returned stock controls and accessories.

6. If the unit is unrepairable, you will receive a letter of explanation. and be given the option to have the unit returned to you at your expense or to have us scrap the unit.

7. Watlow reserves the right to charge for no trouble found (NTF) returns.

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EZ-ZONE™ ST is covered by U.S. Patent No. 6,005,577 and Patents Pending

TC

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1 Chapter 1: Overview

The EZ-ZONE™ ST Provides Total Thermal System Control

Watlow's new EZ-ZONE™ ST solid-state controller offers complete thermal system control in a single package. You get a PID temperature controller already connected to a high-amperage, solid-state relay with the option of adding a properly sized heat sink, an over-under temperature limit, a shut-down power contactor, digital communications and a remote user interface in one package.

You can stack the EZ-ZONE™ ST into multiple configurations to solve a wide range of application needs.

Features and Benefits

Back panel or DIN rail mount
- Provides several mounting options

Compact package
- Reduces panel size

Touch-safe package
- IP2X-Touch safe with back of hand
- Increases safety for installers and operators

±0.1 percent temperature accuracy
- Provides efficient and accurate temperature control

Agency approvals: (with factory-installed heatsink); (without factory-installed heatsink); CE; RoHS; W.E.E.E.; CSA; NEMA 4 (RUI)
- Limit version features FM approval
- Provides third-party recognition

Three-year warranty
- Provides Watlow reliability and product support

Off-the-shelf designed system solution
- Improves system reliability and reduces wiring
- Reduces installation cost
- Eliminates compatibility headaches often encountered when using many different components and brands

Solid-state relay output
- Provides faster cycling, more precise control, increased heater life and energy efficiency

PID temperature control
- Provides accurate temperature control
- Provides a single input and dual outputs
- Provides standard or advanced PID tuning algorithms.

Optional 485 Modbus™ communication
- Provides connectivity to PC or PLC networks

Optional temperature limit
- Increases safety during under- and over-temperature conditions

Optional mechanical contactor
- Enables circuit safety shutdown driven by a limit controller or a PID alarm output signal

Optional current monitoring feature
- Detects a shorted or half-waving solid-state relay; an open heater circuit; or a failed heater

Optional remote user interface (RUI)
- Uses one RUI for multiple zones
- Shallow panel depth allows it to fit in small spaces
- Eliminates the costs and complexity of having to bring all controller related wires to the front panel
- Enables the use of multiple RUIs to improve the system's usability and flexibility

Optional Solid-state Relay heat sink
- Sized and engineered for specific applications
- Factory assembled heat sink required for UL listing

System diagnostics
- Provides continuous self-monitoring alerts of system trouble, to reduce maintenance and service costs

Advanced controllability algorithms
- TRU-TUNE+™ meets demanding controllability requirements.

PC Software: EZ-ZONE™ ST Configurator
- Wizard-style configuration of controller settings
- Online or offline recipe editing

UL® is a registered trademark of Underwriter's Laboratories Inc.
Modbus™ is a trademark of Schneider Automation Incorporated.

A Conceptual View of the ST

The flexibility of the controller's software and hardware allows a large range of configurations. Acquiring a better understanding of the controller's overall functionality and capabilities while at the same time planning out how the controller can be used will deliver maximum effectiveness in your application.

It is useful to think of the controller in three parts: inputs; procedures; and outputs. Information flows from an input to a procedure to an output when the controller is properly configured. A single ST controller can carry out several procedures at the same time, for instance closed-loop control, monitoring for several different alarm situations and operating switched devices, such as lights and motors. Each process needs to be thought out carefully and the controller's inputs, procedures and outputs set up properly.

Inputs

The inputs provide the information that any given programmed procedure can act upon. In a simple form, this information may come from an operator pushing a button or as part of a more complex procedure it may represent a remote set point being received from another controller.

Each analog input typically uses a thermocouple or RTD to read the temperature of something. It can also read volts, current or resistance, allowing it to use various devices to read humidity, air pressure, operator inputs and others values. The settings in the Analog Input Menu (Setup Page) for each analog input must be configured to match the device connected to that input.

Each digital input reads whether a device is active or inactive. A controller with digital input-output hardware includes two sets of terminals each of which can be used as either an input or an output. Each pair of terminals must be configured to function as either an input or output with the Direction parameter in the Digital Input/Output Menu (Setup Page).

The Function, or EZ, Key on the front panel also operates as a digital input by toggling the function assigned to it in the Digital Input Function parameter in the Function Key Menu (Setup Page).

Functions

Functions use input signals to calculate a value. A function may be as simple as reading a digital input to set a state to true or false, or reading a temperature to set an alarm state to on or off. Or, it could compare the temperature of a process to the set point and calculate the optimal power for a heater.

To set up a function, it's important to tell it what source, or instance, to use. For example, an alarm may be set to respond to either analog input 1 or 2 (instance 1 or 2, respectively).

Keep in mind that a function is a user-programmed internal process that does not execute any action outside of the controller. To have any effect outside of the controller, an output must be configured to respond to a function.

Outputs

Outputs can perform various functions or actions in response to information provided by a function, such as operating a heater; turning a light on or off; unlocking a door; or turning on a buzzer.

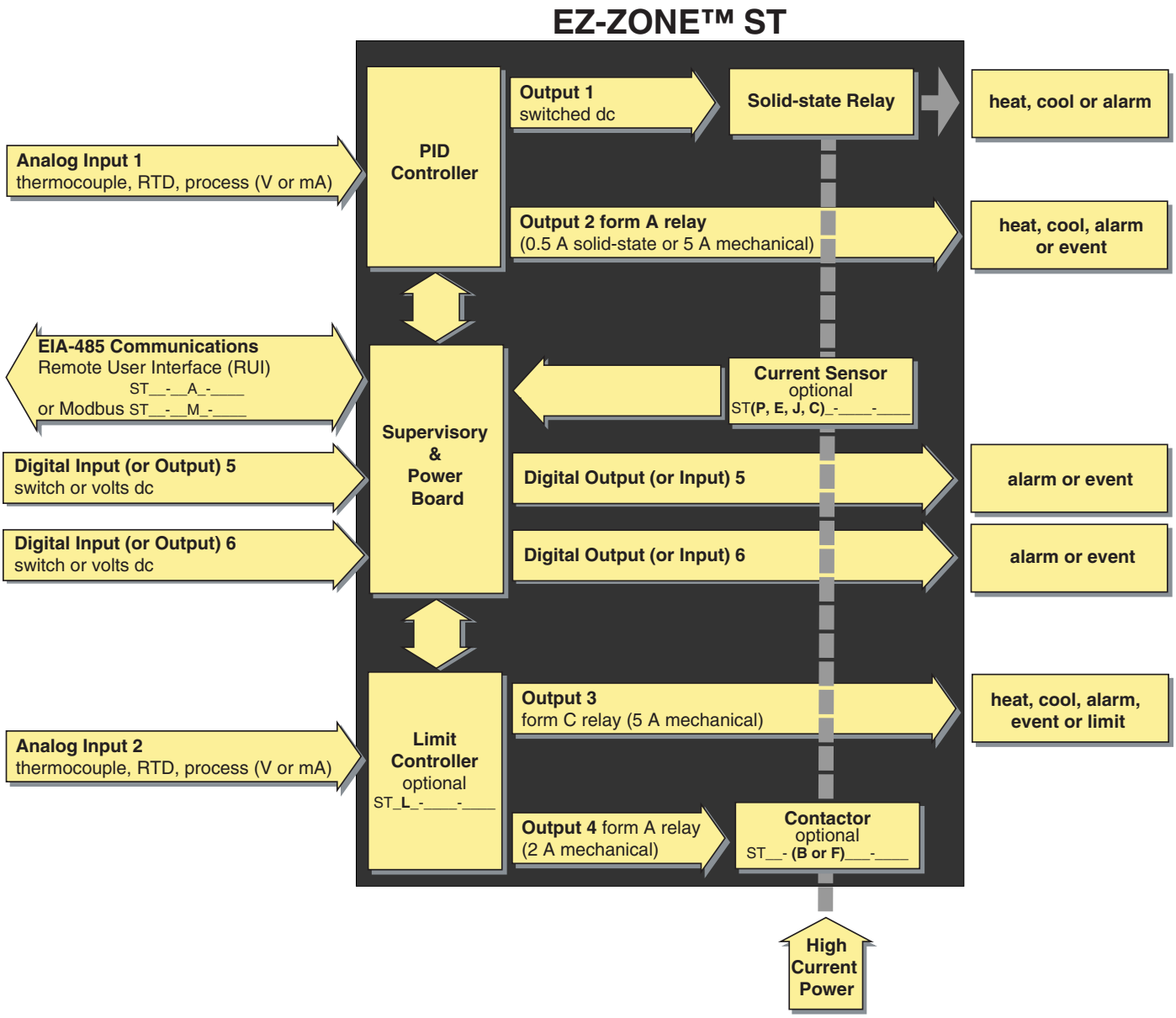
Assign an output to a Function in the Output Menu or Digital Input/Output Menu. Then select which instance of that function will drive the selected output. For example, you might assign an output to respond to alarm 2 (instance 2).

You can assign more than one output to respond to a single instance of a function. For example, alarm 2 could be used to trigger a light connected to output 1 and a siren connected to digital output 5.

Input Events and Output Events

Input events are internal states that are set by the digital inputs. Digital input 5 provides the state of input event 1, and digital input 6 provides the state of input event 2. Wait for Event steps in profiles are triggered by these events. The setting of Digital Input Function (Setup Page, Digital Input/Output Menu) does not change the relationship between the input and the event, so take care not to configure the function in a way that would conflict with a profile that uses an input event. An input will still control the input event state, even if Digital Input Function is set to None.

Output events are internal states that can only be set by profile steps. Outputs 1 through 4 can be configured to respond to output events.



EZ-ZONE™ ST inputs and outputs.

WARNING: When the controller is powered up, the outputs may turn on.

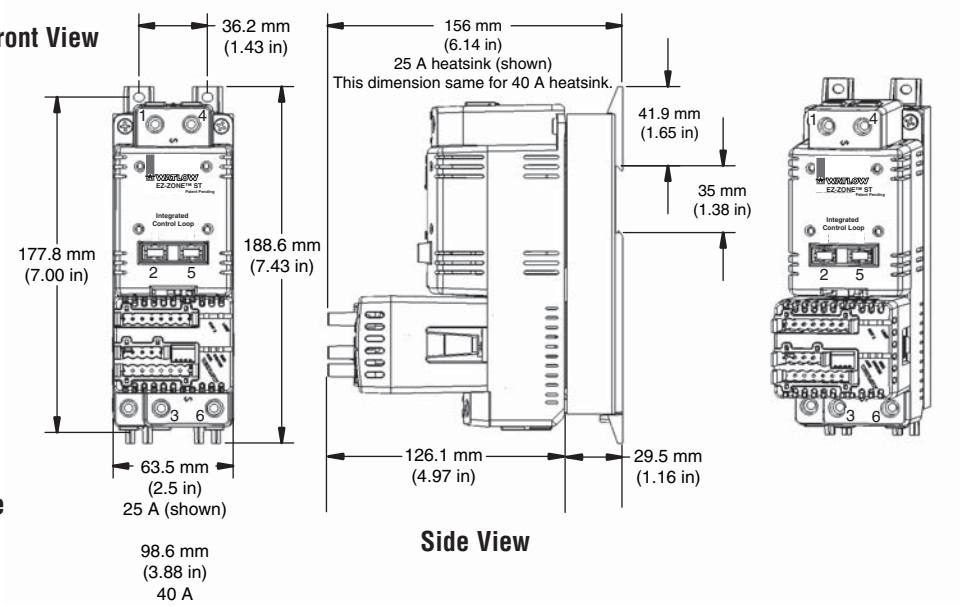
NOTE: A current error can be sent to the RUI (Remote User Interface) soft error display by enabling Current Reading CU.r in the Setup Page.

2 Chapter 2: Install, Wire and Set Address

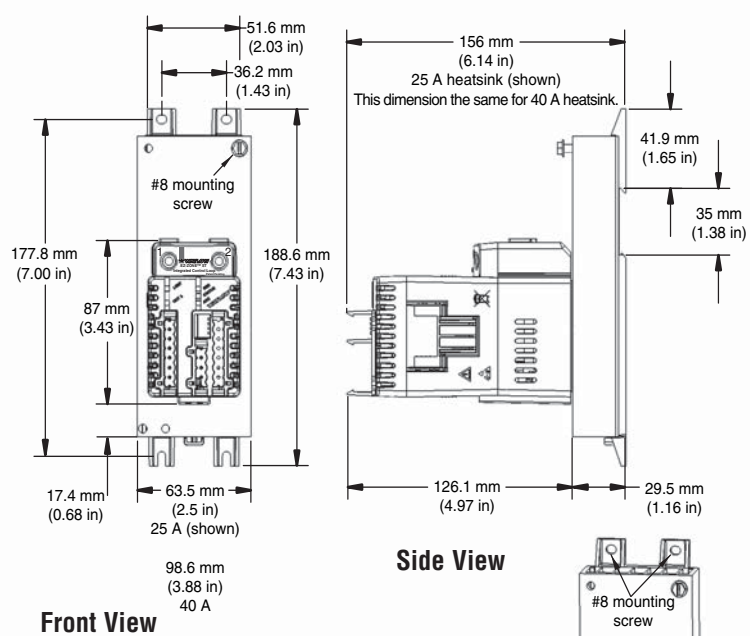
EZ-ZONE™ ST with contactor

WARNING: The heat sink can become hot during operation.

CAUTION: The EZ-ZONE™ ST must be mounted vertically (as shown) to meet the ampere/ambient-temperature performance curve.



EZ-ZONE™ ST without contactor



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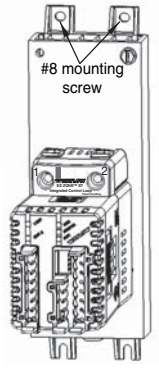
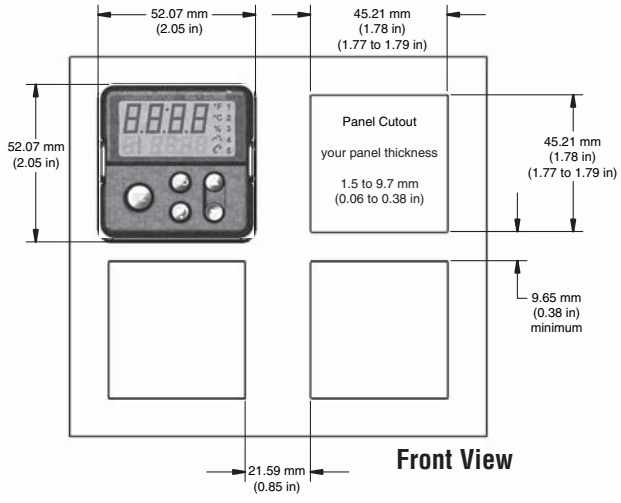
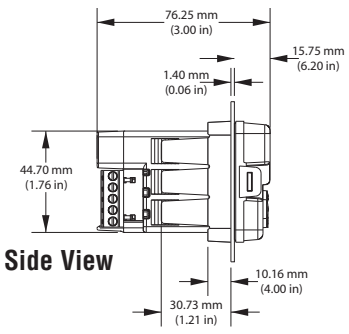


RUI Panel Cutout Dimensions



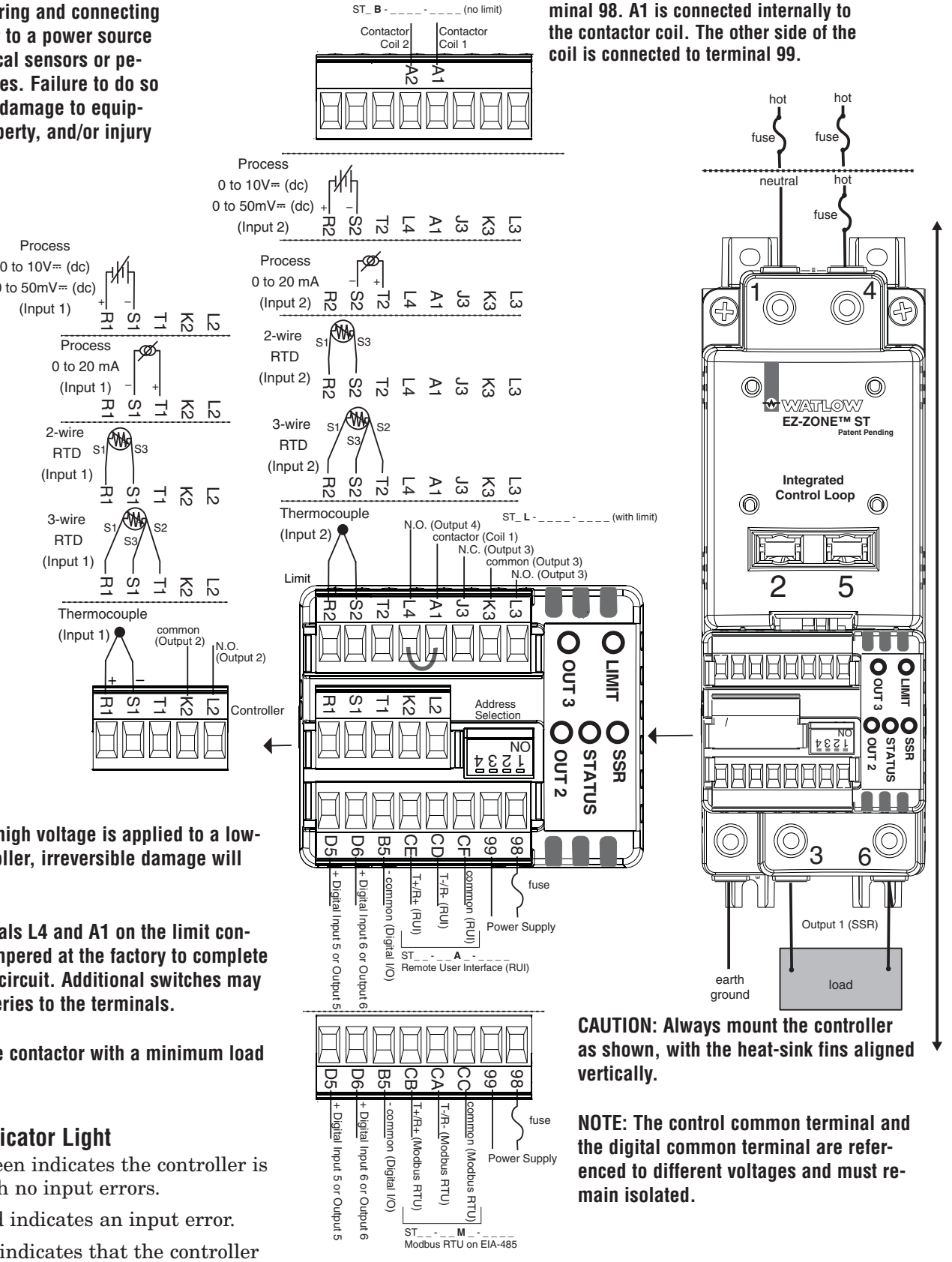


Back View

Wiring
with a contactor (ST _ _ - (B or F) _ _ _ - _ _ _ _)

WARNING: Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

NOTE: A2 is connected internally to terminal 98. A1 is connected internally to the contactor coil. The other side of the coil is connected to terminal 99.



WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

NOTE: Use the contactor with a minimum load of 100 watts.

CAUTION: Always mount the controller as shown, with the heat-sink fins aligned vertically.

NOTE: The control common terminal and the digital common terminal are referenced to different voltages and must remain isolated.

STATUS Indicator Light

Flashing green indicates the controller is running with no input errors.

Flashing red indicates an input error.

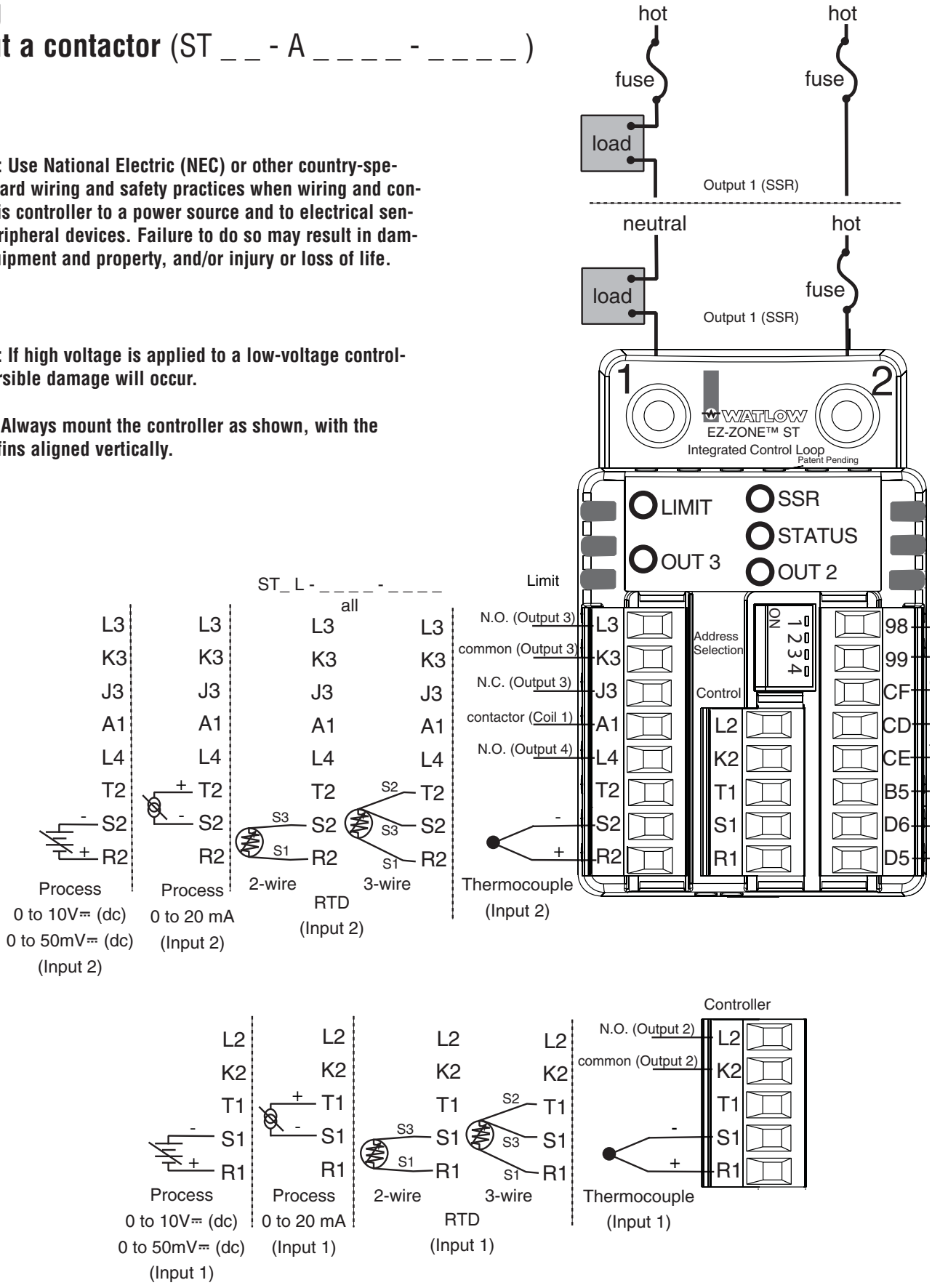
No flashing indicates that the controller is not functioning.

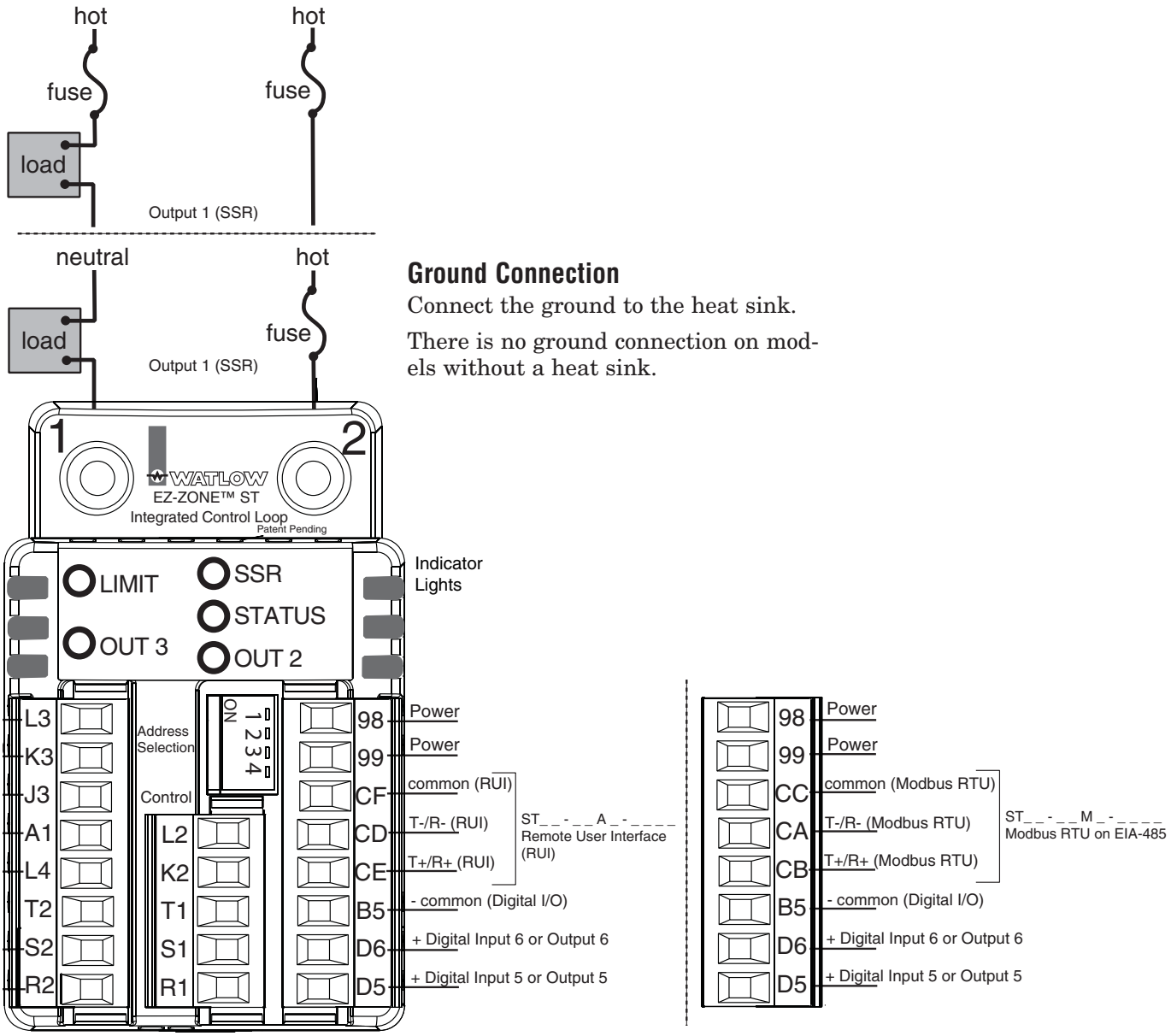
Wiring
without a contactor (ST _ _ - A _ _ _ _ - _ _ _ _)

WARNING: Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

CAUTION: Always mount the controller as shown, with the heat-sink fins aligned vertically.



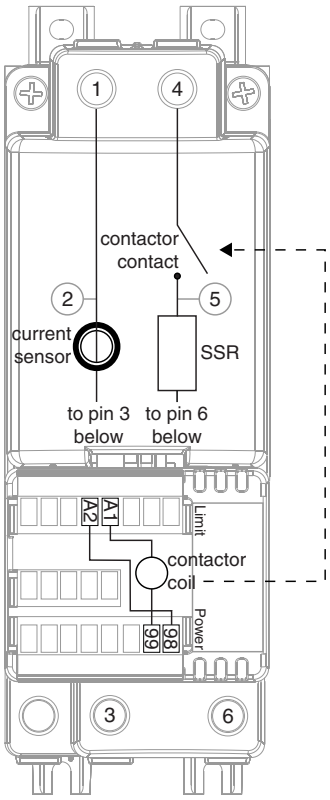


Ground Connection

Connect the ground to the heat sink.

There is no ground connection on models without a heat sink.

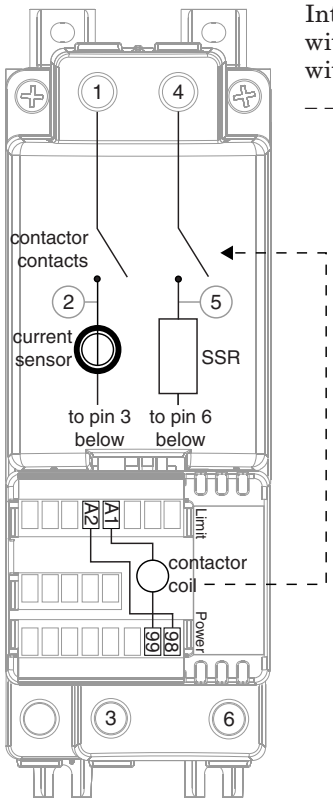
NOTE: The control common terminal and the digital common terminal are referenced to different voltages and must remain isolated.



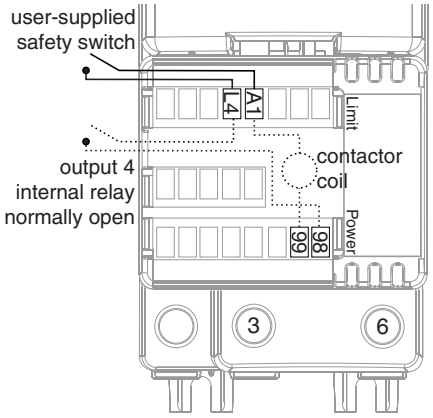
Internal wiring in an ST with a single-pole contactor without a limit (ST _ B - **B** _ _ _ - _ _ _ _).

Use single-pole contactors for hot-to-neutral loads. NEC does not permit neutral to be switched.

Use double-pole contactors for hot-to-hot loads. Both hot legs must be opened together on limit conditions to remove power from circuit.

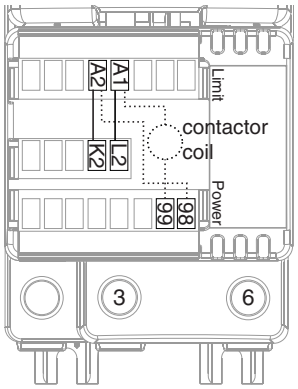


Internal wiring in an ST with a double-pole contactor without a limit (ST _ B - **F** _ _ _ - _ _ _ _).



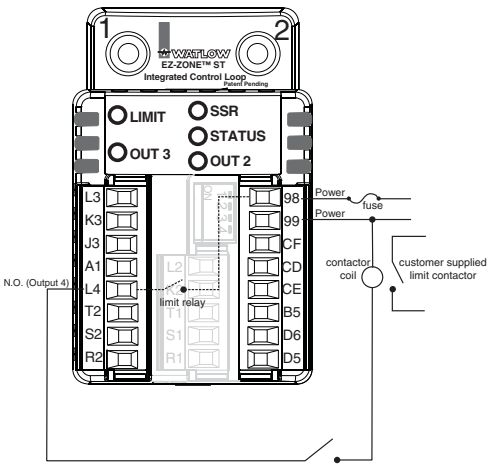
You may remove the factory-installed jumper between A1 and L4 to install a safety switch for the limit relay (ST _ **L** - _ _ _ - _ _ _ _).

(Dotted lines represent internal wiring.)

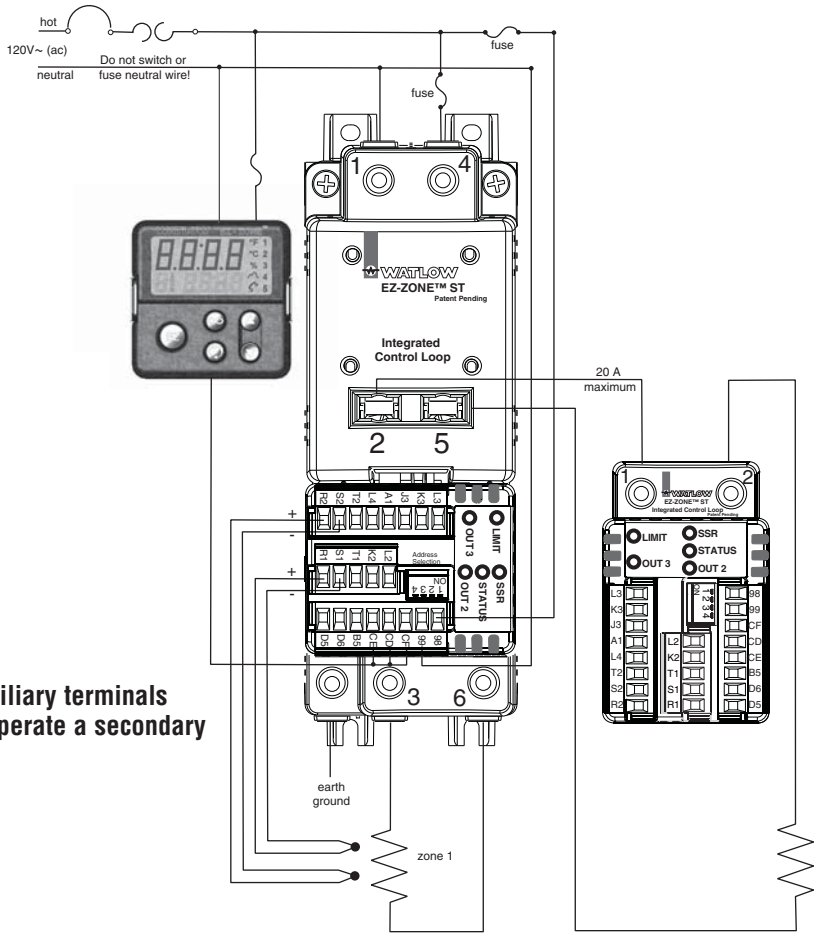


You can use output 2 (L2 and K2) to deactivate the contactor coil on an ST without a limit (ST _ **B** - _ _ _ _ - _ _ _ _).

(Dotted lines represent internal wiring.)



System with a limit using an external contactor (ST _ L - A _ _ _ - _ _ _ _).



System using the auxiliary terminals (20 A maximum) to operate a secondary load.

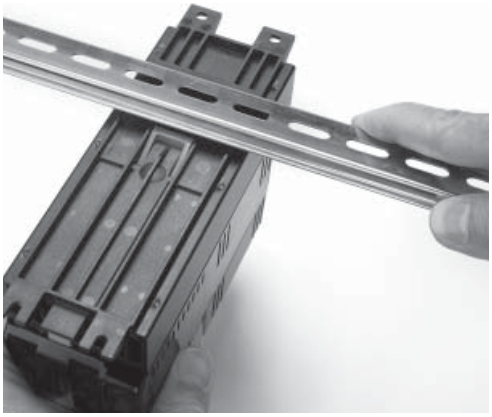
Sub-assembly Labels

The model number at the top of each label identifies the controller configuration.
See Ordering Information and Model Numbers in the Appendix for more detailed information.

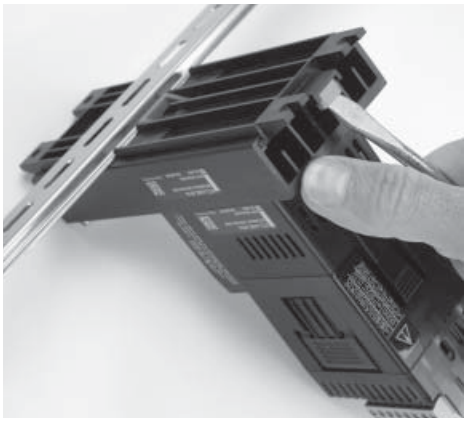
ST _ _ - _ L _ _ - _ _ _ _ 24 to 28V
ST _ _ - _ H _ _ - _ _ _ _ 100 to 240V
ST _ _ - _ 1 _ _ - _ _ _ _ 24V~ (ac)
ST _ _ - _ 2 _ _ - _ _ _ _ 120V
ST _ _ - _ 3 _ _ - _ _ _ _ 208 to 240V

Installation

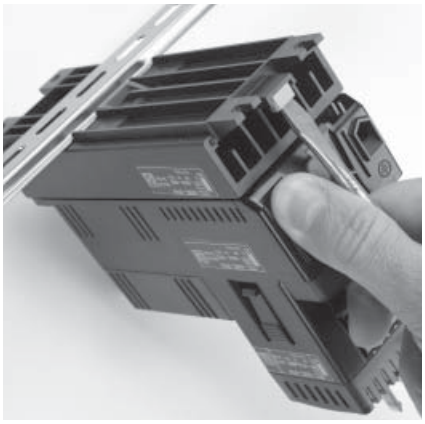
Mounting and Unmounting the Controller from a DIN Rail



To mount the controller on a DIN rail, first hook the top flange on the back of the heat sink on to the top of the DIN rail. Then rotate the controller to an upright position until the lower flange snaps into place.

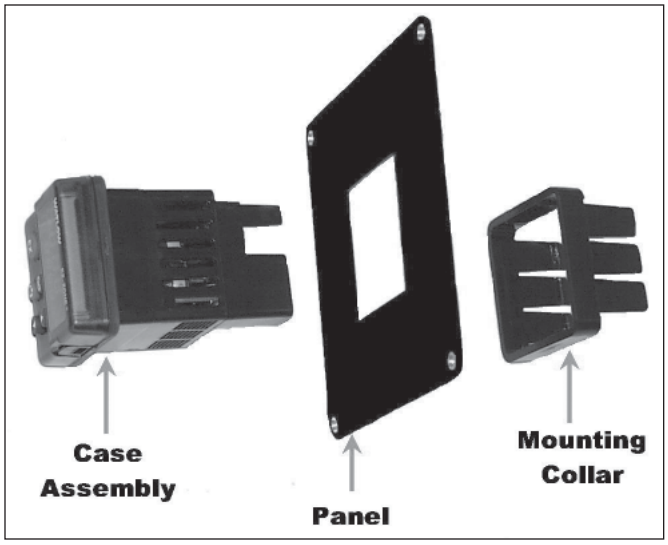


To unmount the controller, first use a screwdriver to pull down the small lever on the bottom of the heat sink and rotate the bottom of the controller forward. Then lift the the controller off of the rail.



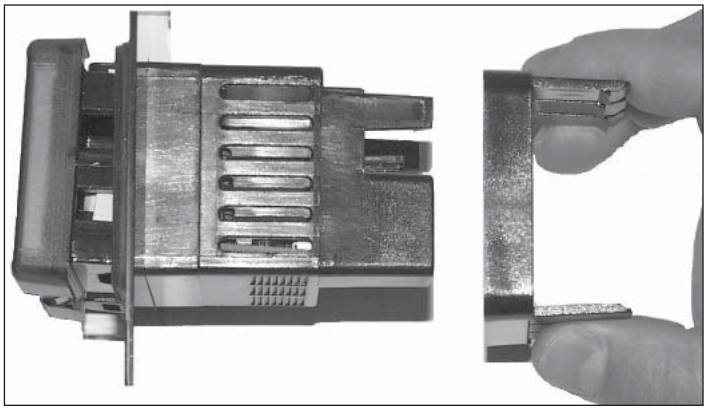
NOTE: Typically, the DIN rail is mounted before components are mounted on it.

Mounting the Remote User Interface (RUI)



1. Make the panel cutout using the mounting template dimensions in this chapter.

Insert the case assembly into the panel cutout.



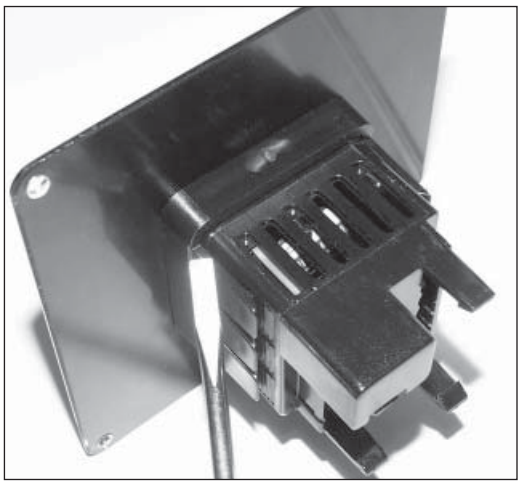
2. While pressing the case assembly firmly against the panel, slide the mounting collar over the back of the RUI.

If the installation does not require an IP65/NEMA 4X seal, slide the mounting collar up to the back of the panel tight enough to eliminate the spacing between the gasket and the panel.

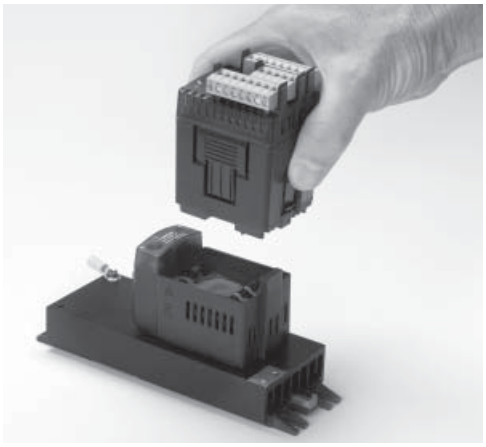
3. For an IP65/NEMA 4X seal, place the blade of a screwdriver in the notch of the mounting collar assembly and push toward the panel while applying pressure to the face of the RUI. Don't be afraid to apply enough pressure to properly install the RUI. If you can move the case assembly back and forth in the cutout, you do not have a proper seal.

The tabs on each side of the bracket have teeth that latch into the ridges. Each tooth is staggered at a different depth from the front so that only one of the tabs one each side is locked onto the ridges at a time.

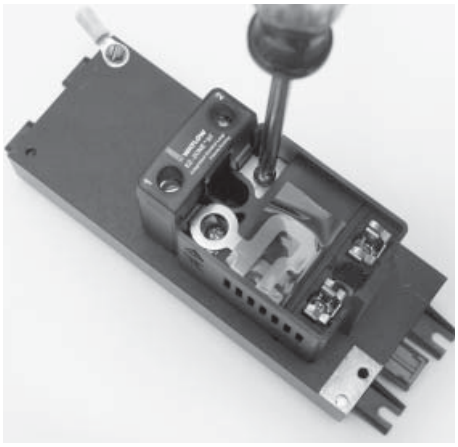
The seal is good if the distance from the panel and the top half of the assembly is 16 mm (0.630 in.) or less, and the distance bottom half and the panel is 13.3 mm (0.525 in.) or less.



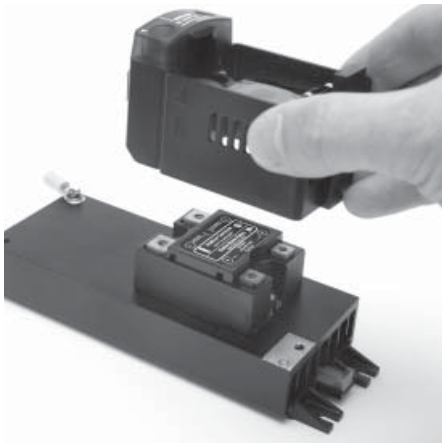
Replacing the Solid-State Relay on a Controller without a Contactor (ST _ _-A _ _ _-_ _ _ _)



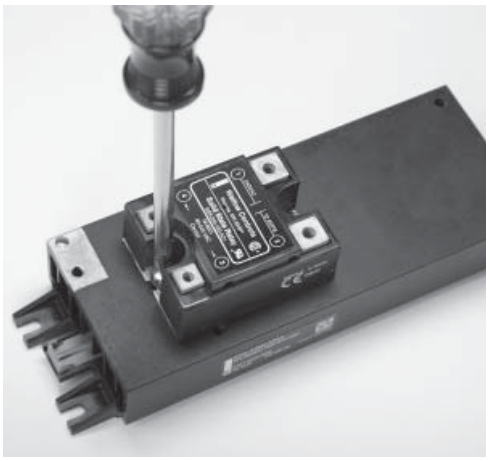
1. Pinch the release levers on the top and bottom of the control module and lift the bottom edge forward to detach the unit.



2. With a Phillips screwdriver, remove the four nearest screws that were under the module.



3. Lift the controller body, exposing the solid-state relay.



4. Using a Phillips screwdriver, remove the two screws connecting the solid-state relay to the heat sink.

Replacing the Solid-state Relay

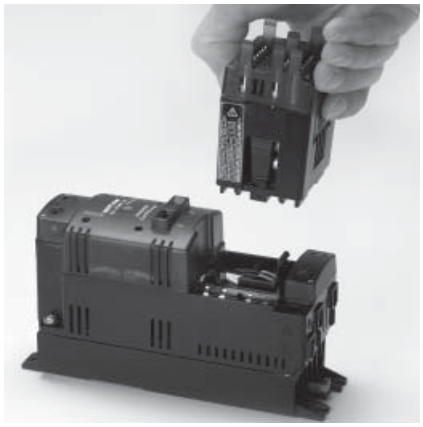
1. Using a Phillips screwdriver, replace the two screws connecting the solid-state relay to the heat sink.

2. Place the controller body over the solid-state relay and, using a Phillips screwdriver, replace the four screws securing it.

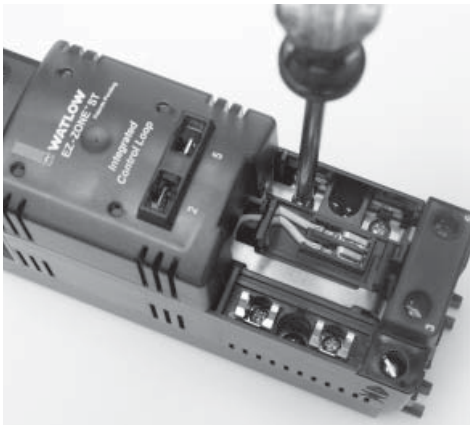
3. Snap the control module in place, bottom edge first.

NOTE: For controller models without a contactor (ST _ _-A _ _ _-_ _ _ _), the solid-state relay must be mounted with the larger power terminals on the top and the smaller control terminals on the bottom.

Replacing the Solid-State Relay on a Controller with a Contactor (ST _ _ - (B or F) _ _ _ - _ _ _ _)

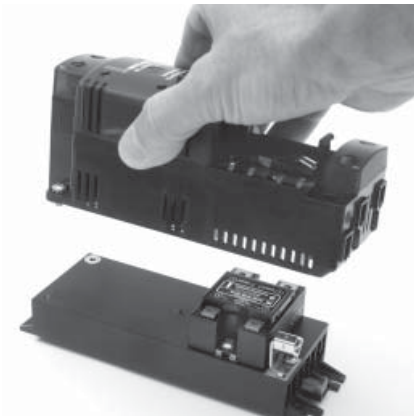


1. Pinch the release levers on the top and bottom of the control module and lift the right edge forward to detach the unit.

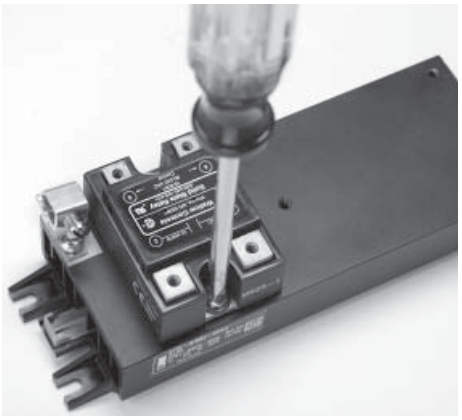


2. With a Phillips screwdriver, remove the four nearest screws that were under the module.

3. With a Phillips screwdriver, remove the two screws at the top corners of the controller.



4. Lift the controller body, exposing the solid-state relay.



5. Using a Phillips screwdriver, remove the two screws connecting the solid-state relay to the heat sink.

Replacing the Solid-state Relay

1. Using a Phillips screwdriver, replace the two screws connecting the solid-state relay to the heat sink. Check that the bottom of the solid-state relay is on the left.

2. Place the controller body over the solid-state relay and, using a Phillips screwdriver, replace the six screw securing it.

3. Snap the control module in place, left edge first.

NOTE: For controller models with a contactor (ST _ _-A _ _ _-_ _ _ _), the solid-state relay must be mounted with the larger power terminals on the right and the smaller control terminals on the left.

Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

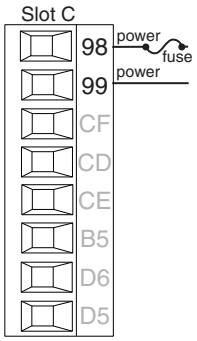
NOTE: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

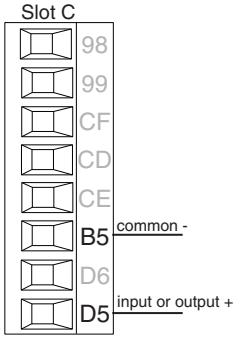
NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

Power



Digital Input or Output 5



Digital Input
- update rate 10 Hz
- dry contact or dc voltage

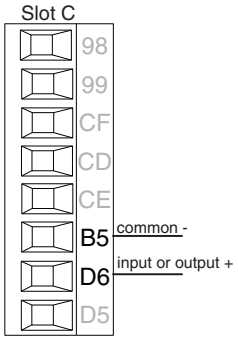
DC voltage
- maximum input 36V at 3 mA
- minimum high state 3V@0.25 mA
- maximum low state 2V

Dry contact
- minimum open resistance 500 Ω
- maximum closed resistance 100 Ω
- maximum short circuit 13 mA

Digital Output
- update rate 10 Hz
- output voltage 24V
- current limit, Output 5, 24 mA maximum
- capable of driving a 3-pole DIN-A-MITE
- open-circuit voltage 22 to 32V⎓ (dc)

ST **(B, C, D or E)** _ - _ _ _ _-_ _ _ _

Digital Input or Output 6



Digital Input
- update rate 10 Hz
- dry contact or dc voltage

DC voltage
- maximum input 36V at 3 mA
- minimum high state 3V@0.25 mA
- maximum low state 2V

Dry contact
- minimum open resistance 500 Ω
- maximum closed resistance 100 Ω
- maximum short circuit 13 mA

Digital Output
- update rate 10 Hz
- output voltage 24V
- current limit, Output 6, 10 mA maximum
- capable of driving a single-pole DIN-A-MITE
- open-circuit voltage 22 to 32V⎓ (dc)

ST **(B, C, D or E)** _ - _ _ _ _-_ _ _ _

Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

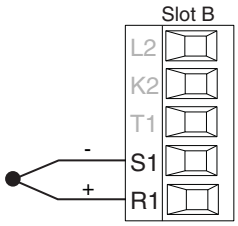
NOTE: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

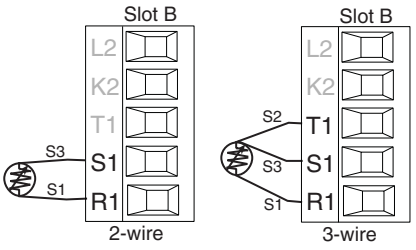
Input 1 Thermocouple



- 20 Ω maximum source resistance
- >20 MΩ input impedance
- 3 microampere open-sensor detection
- Thermocouples are polarity sensitive. The negative lead (usually red) must be connected to S1.
- To reduce errors, the extension wire for thermocouples must be of the same alloy as the thermocouple.

ST _ _ - _ _ _ _ - _ _ _ _ (all)

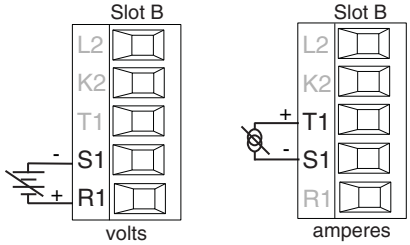
Input 1 RTD



- platinum, 100 and 1,000 Ω @ 0°C
- calibration to DIN curve (0.00385 Ω/Ω/°C)
- 20 Ω total lead resistance
- RTD excitation current of 0.09 mA typical. Each ohm of lead resistance may affect the reading by 0.03°C.
- For 3-wire RTDs, the S1 lead (usually white) must be connected to R1.
- For best accuracy use a 3-wire RTD to compensate for lead-length resistance. All three lead wires must have the same resistance.

ST _ _ - _ _ _ _ - _ _ _ _ (all)

Input 1 Process



- 0 to 20 mA @ 100 Ω input impedance
- 0 to 10V⎓ (dc) @ 20 kΩ input impedance
- 0 to 50 mV⎓ (dc) @ 20 kΩ input impedance
- scalable

ST _ _ - _ _ _ _ - _ _ _ _ (all)

Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

NOTE: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

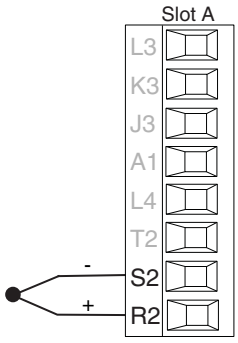
CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

Quencharc Note:
Switching pilot duty inductive loads (relay coils, solenoids, etc.) with the mechanical relay, solid state relay or open collector output options requires use of an R.C. suppressor.

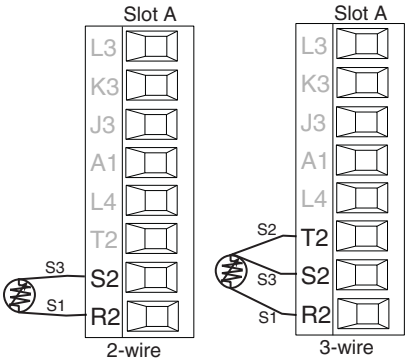
Input 2 Thermocouple



- 20 Ω maximum source resistance
- >20 MΩ input impedance
- 3 microampere open-sensor detection
- Thermocouples are polarity sensitive. The negative lead (usually red) must be connected to S2.
- To reduce errors, the extension wire for thermocouples must be of the same alloy as the thermocouple.

ST _ **L** - _ _ _ _ - _ _ _ _ (limit)

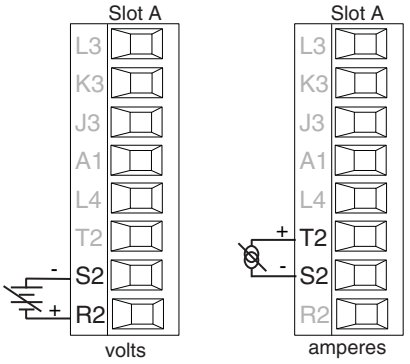
Input 2 RTD



- platinum, 100 and 1,000 Ω @ 0°C
- calibration to DIN curve (0.00385 Ω/Ω/°C)
- 20 Ω total lead resistance
- RTD excitation current of 0.09 mA typical. Each ohm of lead resistance may affect the reading by 0.03°C.
- For 3-wire RTDs, the S1 lead (usually white) must be connected to R2.
- For best accuracy use a 3-wire RTD to compensate for lead-length resistance. All three lead wires must have the same resistance.

ST _ **L** - _ _ _ _ - _ _ _ _ (limit)

Input 2 Process



- 0 to 20 mA @ 100 Ω input impedance
- 0 to 10V⎓ (dc) @ 20 kΩ input impedance
- 0 to 50 mV⎓ (dc) @ 20 kΩ input impedance
- scalable

ST _ **L** - _ _ _ _ - _ _ _ _ (limit)

Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

NOTE: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

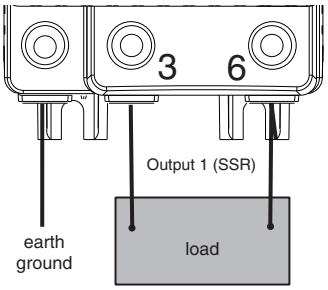
CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

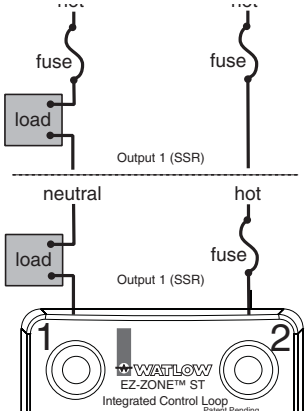
Quencharc Note:
Switching pilot duty inductive loads (relay coils, solenoids, etc.) with the mechanical relay, solid state relay or open collector output options requires use of an R.C. suppressor.

Output 1 Solid-state Relay with a Contactor



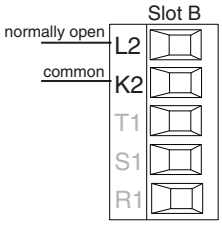
See Quencharc note.
ST _ _ - **B** _ _ _ - _ _ _ _ (contactor)

Output 1 Solid-state Relay without a Contactor



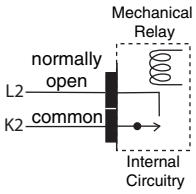
See Quencharc note.
ST _ _ - **A** _ _ _ - _ _ _ _ (no contactor)

Output 2 Mechanical Relay, Form A

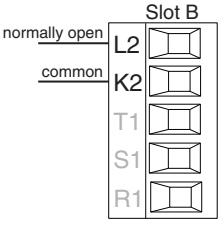


- 5 A at 240V~ (ac) or 30V⎓ (dc) maximum resistive load
- 20 mV at 24V minimum load
- 125 VA pilot duty @ 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- for use with ac or dc

See Quencharc note.
ST **(H, D, J, C)** _ - _ _ _ _ - _ _ _ _

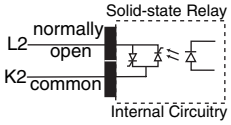


Output 2 Solid-state Relay, Form A



- 0.5 A at 20 to 264V~ (ac) maximum resistive load
- 20 VA 120/240V~ (ac) pilot duty
- opto-isolated, without contact suppression
- maximum off state leakage of 105 microamperes
- Output does not supply power.
- Do not use on dc loads.

See Quencharc note.
ST **(K, B, P, E)** _ - _ _ _ _ - _ _ _ _



Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

NOTE: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

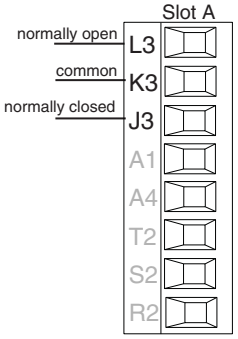
CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

Quencharc Note:
Switching pilot duty inductive loads (relay coils, solenoids, etc.) with the mechanical relay, solid state relay or open collector output options requires use of an R.C. suppressor.

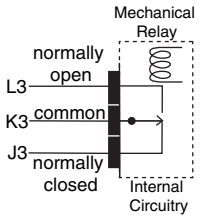
Output 3 Mechanical Relay, Form C



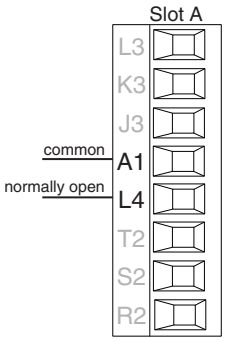
- 5 A at 240V~ (ac) or 30V⎓ (dc) maximum resistive load
- 20 mA at 24V minimum load
- 125 VA pilot duty at 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- for use with ac or dc

See Quencharc note.

ST _ **L** - _ _ _ _ - _ _ _ _ (limit)



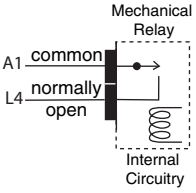
Output 4 Mechanical Relay, Form A



- 2 A at 240V~ (ac) or 30V⎓ (dc) maximum resistive load
- 20 mV at 24V minimum load
- 125 VA pilot duty at 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- for use with ac or dc

See Quencharc note.

ST _ **L** - _ _ _ _ - _ _ _ _ (limit)



Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

NOTE: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

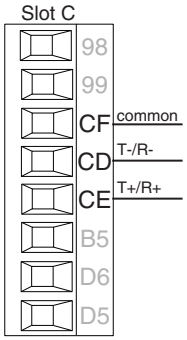
CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

Note: Excessive writes to EEPROM over Modbus can cause premature EEPROM failure. The EEPROM is rated for 1,000,000 writes. See "Saving Settings to Nonvolatile Memory" in Chapter 2, Install and Wire.

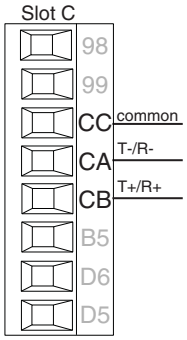
Standard Bus EIA-485 Communications



- Wire T-/R- to the A terminal of the EIA-485 port.
- Wire T+/R+ to the B terminal of the EIA-485 port.
- Wire common to the common terminal of the EIA-485 port.
- Do not route network wires with power wires. Connect network wires in daisy-chain fashion when connecting multiple devices in a network.
- Do not connect more than 16 controllers on a network.
- maximum network length: 1,200 meters (4,000 feet)
- 1/8th unit load on EIA-485 bus

ST _ _ - _ _ **A** _ - _ _ _ _ (RUI)

Modbus RTU or Standard Bus EIA-485 Communications



- Wire T-/R- to the A terminal of the EIA-485 port.
- Wire T+/R+ to the B terminal of the EIA-485 port.
- Wire common to the common terminal of the EIA-485 port.
- Do not route network wires with power wires. Connect network wires in daisy-chain fashion when connecting multiple devices in a network.
- A termination resistor may be required. Place a 120 Ω resistor across T+/R+ and T-/R- of last controller on network.
- Only one protocol per port is available at a time: either Modbus RTU or Standard Bus.
- Do not connect more than 16 controllers on a Standard Bus network.
- Do not connect more than 247 controllers on a Modbus RTU network.
- maximum network length: 1,200 meters (4,000 feet)
- 1/8th unit load on EIA-485 bus.

ST _ _ - _ _ **M** _ - _ _ _ _ (Modbus RTU or EIA-485)

Modbus-IDA Terminal	EIA/TIA-485 Name	Watlow Terminal Label	Function
DO	A	CA or CD	T-/R-
D1	B	CB or CE	T+/R+
common	common	CC or CF	common

Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

NOTE: To prevent ground loops, isolation needs to be maintained from input to output when using switched DC or analog process outputs.

CAUTION: Always mount the controller with the heat-sink fins aligned vertically.

NOTE: Terminals L4 and A1 on the limit connector are jumpered at the factory to complete the contactor circuit. Additional switches may be wired in series to the terminals.

WARNING: If high voltage is applied to a low-voltage controller, irreversible damage will occur.

Note: Excessive writes to EEPROM over Modbus can cause premature EEPROM failure. The EEPROM is rated for 1,000,000 writes. See "Saving Settings to Nonvolatile Memory" in Chapter 2, Install and Wire.

Wiring a Serial EIA-485 Network

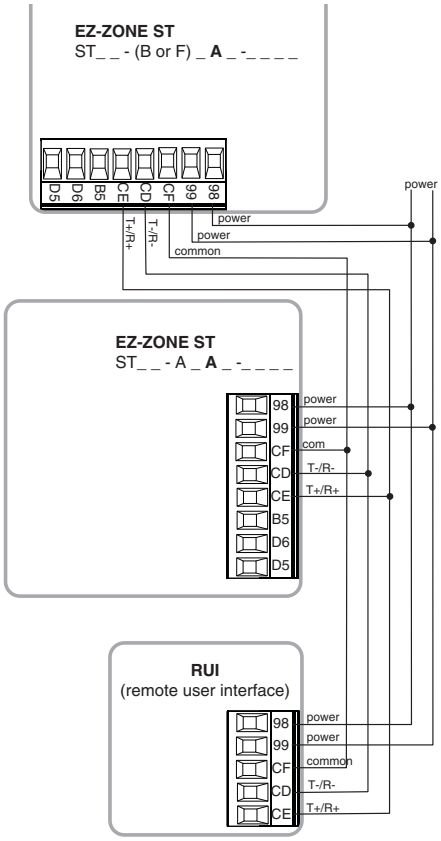
Do not route network wires with power wires. Connect network wires in daisy-chain fashion when connecting multiple devices in a network.

A termination resistor may be required. Place a 120 Ω resistor across T+/R+ and T-/R- of the last controller on a network.

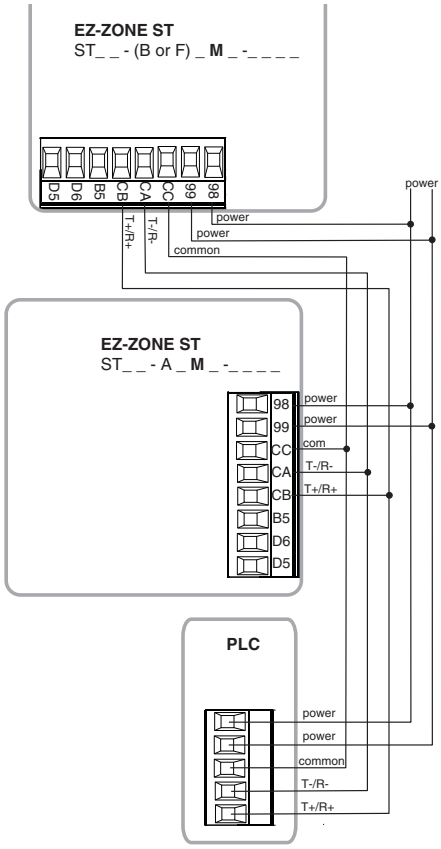
Only one protocol per port is available at a time: either Modbus RTU or Standard Bus.

Note: The RUI (remote user interface) can communicate using Watlow's Standard Bus only.

Note: Do not route network wires with power wires.



Wiring a network of controllers using Watlow's Standard bus and an RUI (remote user interface).



Wiring a network of controllers using Modbus.

Setting the Address

Modbus Controller Address

The address of an EZ-ZONE™ ST controller with the Modbus option (ST _ _-_ _ M _-_ _ _ _) can be set to ranges from 1 to 8 using the DIP switch and ranges 1 to 247 using software.

Set switch 4 to on to use Modbus communications. Modbus™ RTU addresses from 1 to 247 can be programmed into the controller using Standard bus communications. Only one controller can be connected to the network while changing the address using communications. After the Modbus address is changed, all four DIP switches must be turned on (set to 8) and the controller restarted for the new address be become available on the Modbus network. The Modbus addresses set by software will override only address 8, but lower addresses set on the DIP switch will override the software-assigned addresses.

As many as 32 controllers can be connected to a network.

The Standard bus address of an EZ-ZONE™ ST controller with the Modbus™ RTU option (ST _ _-_ _ M _-_ _ _ _) ranges from 1 to 8, because DIP switch 4 is reserved for switching Modbus on or off.

	DIP Switch			
Zone	**1**	**2**	**3**	****4**
1	off	off	off	on
2	on	off	off	on
3	off	on	off	on
4	on	on	off	on
5	off	off	on	on
6	on	off	on	on
7	off	on	on	on
**8	on	on	on	on
**1 to 247	on	on	on	on

**** Set switch 4 to on to use Modbus communications. Modbus addresses from 1 to 247 can be programmed into the controller using Standard bus communications. After the Modbus address is changed, all four DIP switches must be turned on (set to 8) for the new address be become available on the Modbus network.**

CAUTION: Changes set by Modbus are immediate. Users will not be able to communicate with the controller after its address, parity or baud rate has been changed. The master device will need to be configured to the new settings.

The Modbus communications parameters are in the Communications Menu of the Configurator setup software.

Communications Parameter Name	Range	Modbus (less 40,001 offset)
Address (when all four DIP switches are set to on)	1 to 247	313 (unsigned) rw
Baud	9,600 (188) 19,200 (189) 38,400 (190)	314 (unsigned) rw
Parity	Even (191) Odd (192) None (61)	315 (unsigned) rw
Non-Volatile Save (ST Firmware 2 and higher)	Yes (106) No (59)	317 (unsigned) rw

The following data type conventions are used for Modbus registers:

unsigned: 16-bit unsigned integer
signed: 16-bit signed integer
float: 32-bit IEEE floating point value
long: 32-bit unsigned integer

Saving Settings to Nonvolatile Memory

When controller settings are entered from a remote user interface (RUI), changes are always saved to nonvolatile memory (an EEPROM). If the controller loses power or is switched off, its settings will be restored when it starts again.

The EEPROM will wear out after about 1,000,000 writes, which should not be a problem with changes made from the RUI. However if the controller is receiving instructions from a PLC or a computer through a network connection, the EEPROM could, over time, wear out. The Nonvolatile Memory Save parameter allows the user to save settings made over the network to either volatile or nonvolatile memory.

By default, settings made through the network are not saved to nonvolatile memory. However, every time a setting is changed through an RUI, all of the controller settings are saved to nonvolatile memory, regardless of the setting of Nonvolatile Memory Save. This parameter can only be changed via the network and will always be saved to nonvolatile memory. (See table above.)

Watlow Standard Bus Controller Address

The address of an EZ-ZONE™ ST controller with the Watlow Standard bus option (ST _ _-_ _ A _-_ _ _ _) ranges from 1 to 16, where up to 16 controllers can be connected on the network. A RUI (remote user interface) will only recognize addresses 1 through 4, where the relationship between the RUI and the controller it is connected to is selected on the RUI.

As many as eight RUIs can be connected to a network and assigned addresses 1 to 8.

As many as four personal computers can beconnected to a network and assigned addresses 1 to 4.

The Standard bus address of an EZ-ZONE™ ST controller with the Modbus™ RTU option (ST _ _-_ _ M

_-_ _ _ _) ranges from 1 to 8, because DIP switch 4 is reserved for switching Modbus on or off.

	DIP Switch			
Zone	**1**	**2**	**3**	***4**
1	off	off	off	off
2	on	off	off	off
3	off	on	off	off
4	on	on	off	off
5	off	off	on	off
6	on	off	on	off
7	off	on	on	off
8	on	on	on	off
*9	off	off	off	on
*10	on	off	off	on
*11	off	on	off	on
*12	on	on	off	on
*13	off	off	on	on
*14	on	off	on	on
*15	off	on	on	on
*16	on	on	on	on

*** The Standard bus address of an EZ-ZONE™ ST controller with the Modbus RTU option (ST _ _-_ _ M _-_ _ _ _) ranges from 1 to 8, because DIP switch 4 is reserved for switching Modbus on or off.**

Note: Excessive writes to EEPROM over Modbus can cause premature EEPROM failure. The EEPROM is rated for 1,000,000 writes. See "Saving Settings to Nonvolatile Memory" in Chapter 2, Install and Wire.

3 Chapter 3: Using the Interfaces

Remote User Interface (RUI) Keys and Displays

Upper Display:
In the Home Page, displays the process value, otherwise displays the value of the parameter in the lower display.

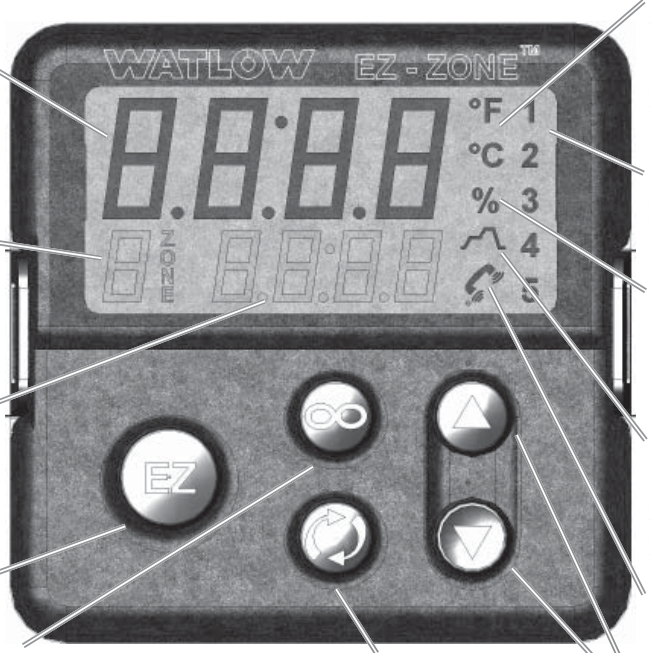
Zone Display:
Indicates the controller zone that the remote user interface (RUI) is currently communicating with.

1 to 9 = zones 1 to 9

A = zone 10
b = zone 11
C = zone 12
d = zone 13
E = zone 14
F = zone 15
H = zone 16

Lower Display:
Indicates the set point or output power value during operation, or the parameter whose value appears in the upper display.

EZ Key:
This key can be programmed to do various tasks, such as starting a profile.



Infinity Key
In the Home Page, press to scroll through the network zones.

In other prompts, press to back up one level, or press and hold for three seconds to return to the Home Page.

Advance Key
Advances through parameter prompts.

Temperature Units Indicator Lights:
Indicates whether the temperature is displayed in Fahrenheit or Celsius.

Output Activity:
Number lights indicate output activity.

Percent Units Indicator
Lights when the controller is displaying values as a percentage.

Profile Activity;
Lights when a profile is running. Flashes when a profile is paused.

Communications Activity
Flashes when the RUI is communicating with a controller.

Up and Down Keys
In the Home Page, adjusts the set point in the lower display. In other pages, changes the upper display to a higher or lower value, or changes a parameter selection.

To Clear an Alarm

If the alarm condition has ended, from the Home Page, press the Advance Key. If there are any active messages, [iGnr] will appear in the upper display and the alarm instance will appear in the lower display.

Use the Down Arrow Key to scroll through the messages and the Up Arrow Key to clear the alarm.

Error and Alarm Messages

[AtEn] will appear in the lower display with the error message in the upper display.

[Er.i1] Error Input 1

[Er.i2] Error Input 2

[AL 1] Alarm 1 (For alarm details, query the

[AL 2] Alarm 2 process value and alarm settings.)

[LiM] Limit

[tUnE] Tuning

[rP] Ramping

[d.Err] Device Error

[C.Er] Current Error

[h.Er] Heater Error

No Device Connected

If no device is connected to the RUI or the controller on the selected zone is disconnected, [no] will appear in the upper display and [dEv] will appear in the lower display. Press the Infinity Key to move to the next zone.

If a zone disappears, check network wiring.

The RUI Page

To go to the RUI Page from the Home Page, press both the Down ▼ and Advance ◉ keys for three seconds. L (local) will appear in the Zone Display, bUS will appear in the upper display and rUI will appear in the lower display.

- Press the Up ▲ or Down ▼ key to move through the menus.
- Press the Advance Key ◉ to select a menu.
- Press the Advance Key ◉ to move through the parameters of the menu.
- Press the Up ▲ or Down ▼ key to move through the parameter values.
- Press the Infinity Key ∞ to move backwards through the levels: parameter to menu; menu to Home Page.
- Press and hold the Infinity Key ∞ for two seconds to return to the Home Page.

Display	Parameter name Description	Settings	Range	Default	Appears If
bUS **Communications Menu**					
Ad.S [Ad.S]	**RUI Address** Set the address of this RUI. Each RUI on the network must have a unique address.		1 to 8	1	always
St.Zn [St.Zn]	**Start Zone** Set the lowest address that this RUI will communicate with. Narrowing the range of addresses will speed up some operations.		1 to 16	1	always
nU.Zn [nU.Zn]	**Number of Zones** Set the number of contiguous addresses that this RUI will communicate with. Narrowing the range of addresses will speed up some operations.		1 to 16	8	always
LoC **Lockout Menu**		* The positions of the Operations Page and Profiling Page in the ranges below can be changed in the Lock Menu (Factory Page). See the examples at the end of this chapter.			
rLoC [rLoC]	**Read Lock** Set the read-only security clearance level. The user can access the selected level and all lower levels. If the Set Lock level is higher than the Read Lock, the Read Lock level takes priority.		1 Home Page 2 Operations Page* 3 Profiling Page* 4 Setup Page & Diagnostics Menu 5 Lock, Calibration & Custom menus	5	always
SLoC [SLoC]	**Set Lock** Set the read-write security clearance level. The user can access the selected level and all lower levels. If the Set Lock level is higher than the Read Lock, the Read Lock level takes priority.		0 No changes allowed 1 Home Page 2 Operations Page* 3 Profiling Page* 4 Setup Page & Diagnostics Menu 5 Lock, Calibration & Custom menus	5	always
diAG **Diagnostics Menu**					
S.id [S.id]	**Software ID** View the software ID.				always
S.rL [S.rL]	**Software Release** View the software release number.				always
S.Pr [S.Pr]	**Software Prototype** View the software minor version number.				always
S.bLd [S.bLd]	**Software Build** View the software build number.				always
Sn [Sn]	**Serial Number** View the controller serial number.				always
dAtE [dAtE]	**Date of Manufacture** View the controller manufacture date.				always
USr.r [USr.r]	**User Restore Set** Restore the factory default RUI Page settings or load a saved configuration.		none Don't change settings FCty Factory settings SEt 1 User Set 1 SEt 2 User Set 2	Don't change	always

Display	Parameter name Description	Settings	Range	Default	Appears If
USr.S [USr.S]	**User Save Set** Save the RUI Page settings.		none Don't change settings SEt 1 User Set 1 SEt2 User Set 2	Don't change	always
C.LEd [C.LEd]	**Communications LED Assignment** Set the activity that the communications indicator light will monitor.		Com1 Comms Port 1 Com2 Comms Port 2 both Comms Ports 1 & 2 oFF no monitoring		always

Changing the Position of the Operations Page or Profiling Page in the Lockout Menu

To change the position of the Operations Page or Profiling Page in the Lockout Menu, you must go to the Lock Operations Page parameter [LoC.O] or Lock Profiling Page parameter [LoC.P] in the Lockout Menu in the Factory Page.

- To go to the Factory Page from the Home Page, press both the Advance ◉ and Infinity ∞ keys for six seconds. [CUSt] will appear in the Upper Display and [FCty] will appear in the Lower Display.
- Press the Up ▲ or Down ▼ key to move to the Lockout Menu [LoC].
- Press the Advance Key ◉ to select a parameter.
- Press the Up ▲ or Down ▼ key to change the parameter value. The value you select (1, 2 or 3) will determine the position of the Operations Page or Profiling Pages in the Lockout Menu in the RUI Page.
- Press the Infinity Key ∞ to move backwards through the levels: parameter to menu; menu to Home Page.
- Press and hold the Infinity Key ∞ for two seconds to return to the Home Page.

Example 1

The operator wants to read all the menus and not allow any parameters to be changed.

In the RUI Page, Lockout Menu, set Read Lock [rLoC] to 5 and Set Lock [SLoC] to 0.

Example 2

The operator wants to read and write to the Home Page and Profiling Page, and lock all other pages and menus.

In the RUI Page, Lockout Menu, set Read Lock [rLoC] to 2 and Set Lock [SLoC] to 2.

In the Factory Page, Lockout Menu, set Lock Operations Page [LoC.O] to 3 and Lock Profiling Page [LoC.P] to 2.

Example 3

The operator wants to read the Operations Page, Setup Page. Profiling Page, Diagnostics Menu, Lock Menu, Calibration Menu and Custom Menus. The operator also wants to read and write to the Home Page.

In the RUI Page, Lockout Menu, set Read Lock [rLoC] to 1 and Set Lock [SLoC] to 5.

In the Factory Page, Lockout Menu, set Lock Operations Page [LoC.O] to 2 and Lock Profiling Page [LoC.P] to 3.

Programming the EZ Key

You can program the Remote User Interface (RUI) EZ Key either in the Setup Menu using the RUI or with configuration software, such as EZ-ZONE Configurator, using a personal computer.

The following examples show how to program the EZ Key to start and stop a profile.

Using the RUI

1. To go to the Setup Page from the Home Page, press both the Up ▲ and Down ▼ keys for six seconds. [A1] will appear in the upper display and [SEt] will appear in the lower display.

2. Press the Up Key ▲ twice. [FUn] will appear in the upper display and [SEt] will appear in the lower display.

3. Press the Advance Key ◉ once. [ProF] will appear in the upper display and [d.Fn] (Digital Input Function) will appear in the lower display.

3. Press the Up ▲ or Down ▼ key to scroll through the functions that can be assigned to the EZ Key. When [P.StS] (Profile Start/Stop) appears in the upper display and [d.Fn] appears in the lower display, press the Infinity Key once to select that function and move to the [F.1S] (Function Instance) parameter.

4. Press the Up ▲ or Down ▼ key to scroll to the profile that you want the EZ Key to control.

5. Press the Advance Key ◉ to make your selection and move back to the Digital Input Function parameter. Or press the Infinity Key ∞ once to return to the submenu, twice to return to the main menu or three times to return to the Home Page.

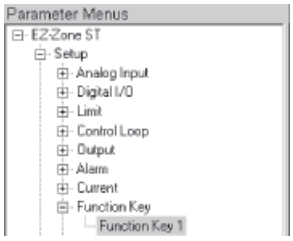
Using EZ-Zone Configurator Software

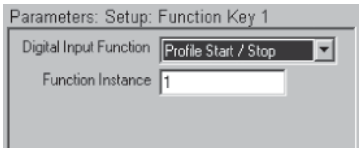
1. Set the communications protocol to Standard Bus. Make the necessary physical connections between the personal computer and the EZ-ZONE™ ST via the EIA485 port. Run the software and allow it to connect to the controller by directing it or allowing it to find the appropriate communications port.

2. After the software connects to the controller, look on the left side of your screen under the Parameters Menus for Function Key under Setup. Click on the plus sign to reveal the Function Key 1 submenu.

3. Click on Function Key 1, then select a Digital Input Function and a Function Instance.

If you want to start and stop a profile with the EZ Key, select Profile Start/Stop and the number of the profile that you want the EZ Key to control.

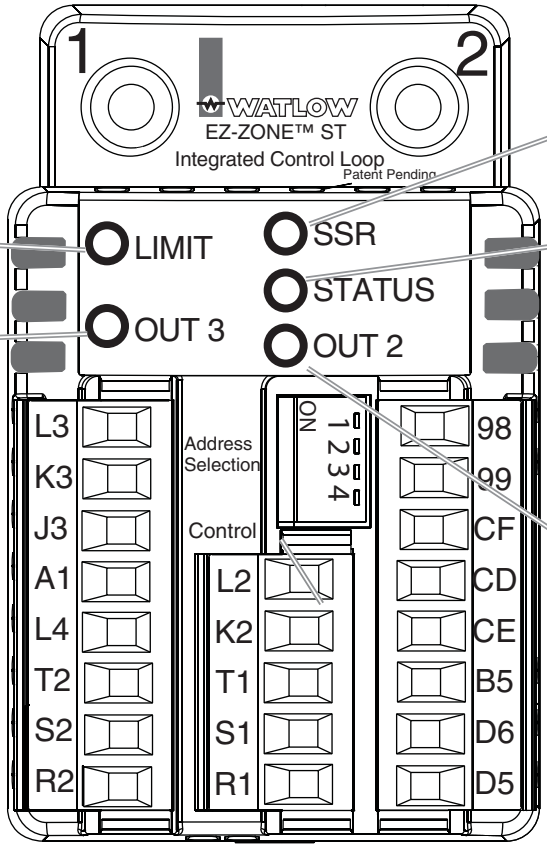




Indicator Lights on the Controller Case

Limit:
Indicates that the controller is in a limit state.

Output 3:
Indicates that output 3 is in an on state.



Solid-state Relay:
Indicates that the solid-state relay is in an on state.

Status:
Flashing green indicates the controller is running with no input errors.

Flashing red indicates an input error.

No flashing indicates that the controller is not functioning.

Output 2:
Indicates that output 2 is in an on state.

4 Chapter 4: Home Page

Default Home Page Parameters

The Home Page is a customized list of as many as 20 parameters that can be configured and changed in the Custom Menu CUSt (Factory Page). The default list of 10 parameters below includes the Active Process Value (value in upper display) and Active Set Point (value in lower display). The Action parameter only appears if there is an active message. (See "To Clear an Alarm" in the RUI Keys and Displays chapter.)

Use the Advance Key ⊙ to step through the other parameters. The parameter prompt will appear in the lower display, and the parameter value will appear in the upper display. You can use the Up ▲ and Down ▼ keys to change the value of read-write parameters, just as you would in any other menu.

Default Home Page (Default parameters appear only on models that support those options.)

Custom Menu Number	Home Page Display (defaults)	Parameter Name	Settings	Custom Menu Display (defaults)	Parameter Page and Menu
1 Upper Display	(value only)	Active Process Value		AC.Pu	Operations Page, Analog Iput Menu
2 Lower Display	(value only)	*Active Set Point		AC.SP	Operations Page, Profile Status Menu
3	AEtn	Message Action		ACtn	Home Page only (See RUI Chapter.)
4	C.P7 1	Control Mode		C.P7	Operations Page, Loop Menu
5	h.Pr 1	Heat Power		h.Pr	Operations Page, Monitor Menu
6	C.Pr 1	Cool Power		C.Pr	Operations Page, Monitor Menu
7	AUt 1	Autotune		AUt	Operations Page, Loop Menu
8	id.S 1	Idle Set Point		idLE	Operations Page, Loop Menu
9	P.St 1	Profile Start		P.Str	Home Page only (See Profile Page Chapter.)
10	P.AC 1	Profile Action Request		P.ACr	Home Page only (See Profile Page Chapter.)
11 to 20	(skipped)	None		nonE	(Add parameters to the Home Page in the Custom Menu, Factory Page.)

* If Control Mode is set to Auto, the process value is in the upper display and the Closed Loop Set Point (read-write) is in the lower display.

If a profile is running, the process value is in the upper display and the Target Set Point (read only) is in the lower display.

If Control Mode is set to Manual, the process value is in the upper display and the output power level (read-write) is in the lower display.

If Control Mode is set to Off, the process value is in the upper display and oFF (read only) is in the lower display.

If a sensor failure has occurred, - - - - is in the upper display and the output power level (read-write) is in the lower display.

Parameters that Appear Only in the Home Page

Display	Parameter Name Description	Setting	Range	Default	Modbus (less 40,001 offset) read/write	Appears If
AtEn	**Message Action** View (Down Key) and clear (Up Key) active alarm and error messages.		Er.i1 Error Input 1 Er.i2 Error Input 2 AL 1 Alarm 1 AL 2 Alarm 2 Lim Limit tUnE Tuning rP Ramping dEr Device Error CEr Current Error hEr Heater Error			an alarm or error message is active.
PSt1	**Profile Start** Select a profile or step number that will be affected by Profile Action.		0 to 40	0	292 rw	the controller includes profiling (ST_ _-_ _ _ _-P _ _ _).
PAC1	**Profile Action Request** Select the action to apply to the profile (1 to 4) or step selected in Profile Start.		nonE No Action (61) ProF Start a Profile (77) StEP Start a Step (89) PAUS Pause (146) rESU Resume (147) End End (148)	No Action	306 rw	the controller includes profiling (ST_ _-_ _ _ _-P _ _ _).

Navigating the Pages and Menus

Home Page — **Communications Menu**

Process Value: 1234 ← (Home Page)
Set Point: 1234 ▼ ◉ → bUS rUi

Hold both keys for 3 seconds. → **RUI Page**

Home Page — **Analog Input Menu**

Process Value: 1234 ← (Home Page)
Set Point: 1234 ▼ ▲ → Ai oPEr

Hold both keys for 3 seconds. → **Operations Page**

Home Page — **Analog Input Menu**

Process Value: 1234 ← (Home Page)
Set Point: 1234 ▼ ▲ → Ai SEt

Hold both keys for 6 seconds. → **Setup Page**

Home Page — **Profile 1**

Process Value: 1234 ← (Home Page)
Set Point: 1234 ◉ → P1 ProF

Hold key for 3 seconds. → **Profile Page**

Home Page — **Custom Menu**

Process Value: 1234 ← (Home Page)
Set Point: 1234 ◉ (Home Page) → CUSt FctY

Hold both keys for 6 seconds. → **Factory Page**

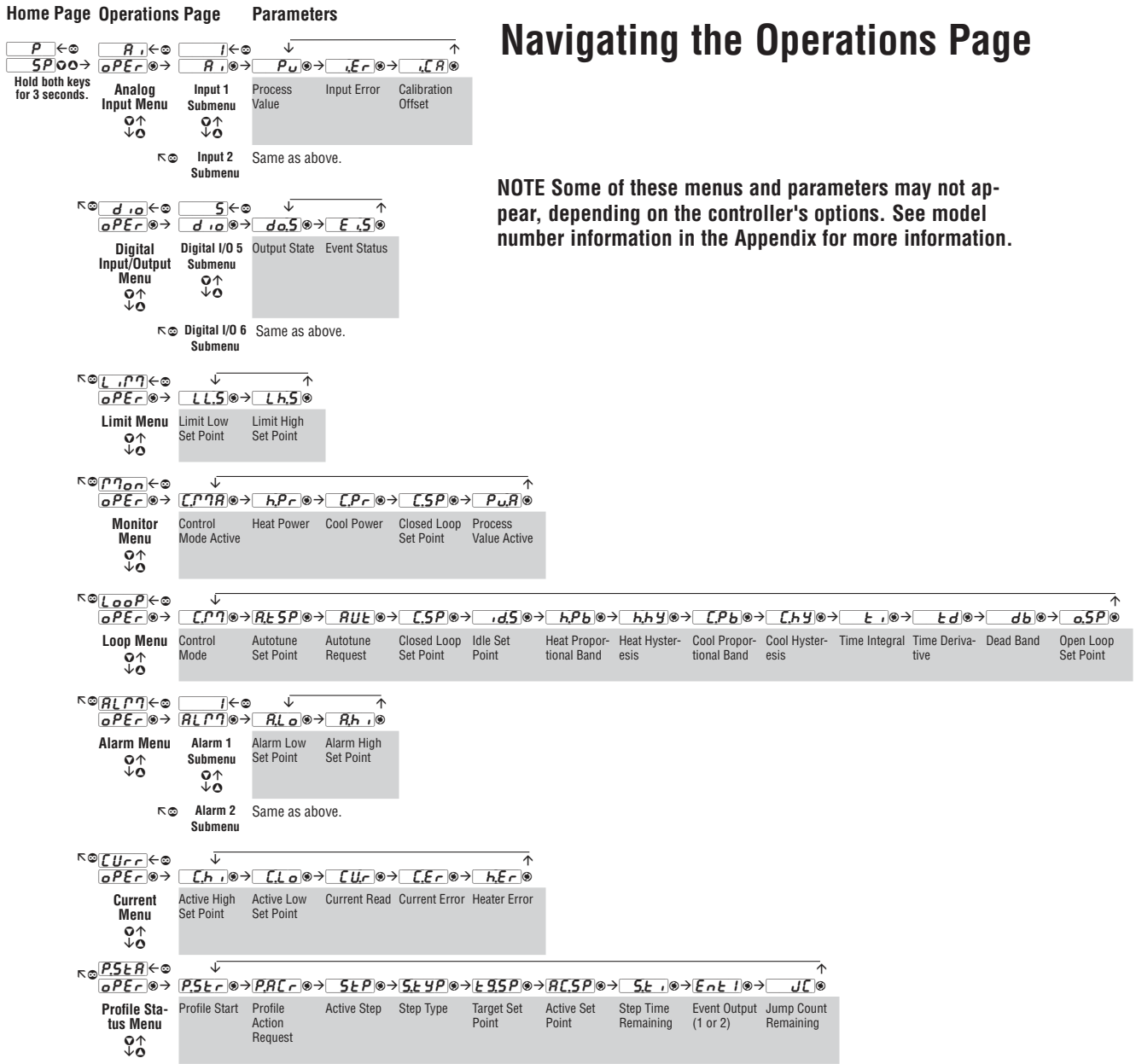
5 Chapter 5: Operations Page

To go to the Operations Page from the Home Page, press both the Up ▲ and Down ▼ keys for three seconds. A1 will appear in the upper display and oPEr will appear in the lower display.

- Press the Up ▲ or Down ▼ key to move through the menus.
- Press the Advance Key ◉ to move to a submenu.
- Press the Up ▲ or Down ▼ key to move through the submenus.
- Press the Advance Key ◉ to move through the parameters of the submenu.
- Press the Infinity Key ∞ to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.
- Press and hold the Infinity Key ∞ for two seconds to return to the Home Page.

Navigating the Operations Page

NOTE Some of these menus and parameters may not appear, depending on the controller's options. See model number information in the Appendix for more information.



Display	Parameter name Description	Set-tings	Range	Default	Modbus* (less 40,001 offset) read/write	Appears If
A1 oPEr **Analog Input Menu**	1 A1 **Analog Input 1**		2 A1 **Analog Input 2** (Analog input 2 appears it ST_L-_ _ _ _-_ _ _ _)			
Pu [Pv]	*Analog Input (1 or 2)* **Process Value** View the process value.		-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C		19 [1 float] 25 [2 float] read only	always
i.Er [i.Er]	*Analog Input (1 or 2)* **Error Status** View the cause of the most recent error.		nonE None (61) oPEn Open (65) Shrt Shorted (127) Er.Ab Ambient Error (9) E.rtd RTD Lead Resistance Error (141)		41 [1 unsigned] 69 [2 unsigned] read only	always
i.CA [i.CA]	*Analog Input (1 or 2)* **Calibration Offset** Offset the input reading to compensate for lead wire resistance or other factors that cause the input reading to vary from the actual process value.		-1,999.000 to 9,999.000°F or units -1,110.555 to 5,555.000°C	0.0	51 [1 float] 79 [2 float] rw	always
d.io oPEr **Digital Input/ Output Menu**	5 d.io **Digital Input Output 5**		6 d.io **Digital Input Output 6**			
do.S [do.S]	*Digital Output (5 or 6)* **Output State** View the state of this output.		on On (63) oFF Off (62)		175 [5 unsigned] 188 [6 unsigned] read only	always
E.iS [Ei.S]	*Digital Input (5 or 6)* **Event Status** View this event input state.		inAct Inactive (41) Act Active (5)		32 [1 unsigned] 33 [2 unsigned] read only	always
L.1n1 oPEr **Limit Menu**						
LL.S [LL.S]	*Limit* **Low Set Point** Set the low process value that will trigger the limit.		-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	0.0°F or -18.0°C	275 [float] rw	Limit Sides (Setup Page) is not set to High.
Lh.S [Lh.S]	*Limit* **High Set Point** Set the high process value that will trigger the limit.		-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	0.0°F or -18.0°C	277 [float] rw	Limit Sides (Setup Page) is not set to Low.
	Limit **Clear Request** Write to this regieter to clear a limit state.		0		272 [unsigned] write only	Modbus only
	Limit **State** View the limit state.		Off (62) None (61) High (51) Low (52) Error (28)		280 [unsigned] read only	Modbus only
1n1on oPEr **Monitor Menu**						
C.1n1A [C.MA]	*Monitor* **Control Mode Active** View the current control mode.		oFF Off (62) Auto (10) 1n1An Manual (54)		222 [unsigned] read only	always

Note: Some values will be rounded off to fit in the four-character display. Full values can be read with Modbus.
All temperature parameters through Modbus are in °F.

*** Low register numbers contain the two lower bytes; high register numbers contain the two higher bytes of the four-byte floating-point value.**

Display	Parameter name Description	Set-tings	Range	Default	Modbus* (less 40,001 offset) read/write	Appears If
h.Pr [h.Pr]	*Monitor* **Heat Power** View the current heat output level.		0.0 to 100.0%		236 [float] read only	always
C.Pr [C.Pr]	*Monitor* **Cool Power** View the current cool output level.		-100.0 to 0.0%		242 [float] read only	always
C.SP [C.SP]	*Monitor* **Closed Loop Set Point** View the set point currently in effect.		-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C		75°F or units 24°C	always
Pv.A [Pv.A]	*Monitor* **Process Value Active** View the current filtered process value using the control input.		-1,999.000 to 9,999.000F or units -1,128.000 to 5,537.000°C		19 [float] read only	always
	Monitor **Alarm 1 State** View the state of alarm 1.		Startup (88) None (61) Blocked (12) Alarm Low (8) Alarm High (7) Error (28)		29 [1 unsigned] read only	Modbus only
	Monitor **Alarm 2 State** View the state of alarm 2.		Startup (88) None (61) Blocked (12) Alarm Low (8) Alarm High (7) Error (28)		30 [2 unsigned] read only	Modbus only
	Monitor **Ambient Temperature** View the ambient temperature.		-1,999.000 to 9,999.000		34 [float] read only	Modbus only
	Monitor **Bumpless Set Point** View the set point that will take effect if a bumpless transfer occurs.		-1,999.000 to 9,999.000		209 [float] read only	Modbus only
	Monitor **Control Loop Output Power** View the output power.		-1,999.000 to 9,999.000		27 [float] read only	Modbus only
	Monitor **Event 1 Status** View the status of event 1.		Inactive (41) Active (5)		32 [unsigned] read only	Modbus only
	Monitor **Event 2 Status** View the status of event 2.		Inactive (41) Active (5)		33 [unsigned] read only	Modbus only
	Monitor **Limit State** View the limit state.		Off (62) None (61) Limit High (51) Limit Low (52) Error (28)		31 [unsigned] read only	Modbus only
	Monitor **Ramp Set Point** View the current ramp set point.		-1,999.000 to 9,999.000		217 [float] read only	Modbus only

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Display	Parameter name Description	Set-tings	Range	Default	Modbus* (less 40,001 offset) read/write	Appears If
	Monitor **Tune Status** View which step the tuning process is in.		Off (62) Waiting for Cross 1 Pos (119) Waiting for Cross 1 Neg (120) Waiting for Cross 2 Pos (121) Waiting for Cross 2 Neg (122) Waiting for Cross 3 Pos (113) Waiting for Cross 3 Neg (150) Measuring Max Peak (151) Measuring Min Peak (152) Calculating (153) Complete (18) Timeout (118)		263 [unsigned] read only	Modbus only
LOOP OPER **Loop Menu**						
CM [C.M]	*Loop* **Control Mode** Select the method that the controller will use to control.		OFF Off (62) AUTO Auto (10) MAN Manual (54)	Auto	221 [unsigned] rw	always
A.TSP [A.tSP}	*Loop* **Autotune Set Point** Set the set point that the autotune will use as a percentage of the current set point.		50.0 to 200.0%	90.0	260 [float] rw	Heat Algorithm or Cool Algorithm (Setup Page) is set to PID.
AUT [AUt]	*Loop* **Autotune Request** Start an autotune. While autotune is active, the Home Page will display ATTN TUN 1. When the autotune is complete, the message will clear automatically.		NO No (59) YES Yes (106)	No	262 [unsigned] rw	Heat Algorithm or Cool Algorithm (Setup Page) is set to PID.
C.SP [C.SP]	*Loop* **Closed Loop Set Point** Set the set point that the controller will automatically control to.		Low Set Point to High Set Point (Setup Page)	75°F or units 24.0°C	21 [float] rw	always
id.S [id.S]	*Loop* **Idle Set Point** Set a set point that can be triggered by an event state.		Low Set Point to High Set Point (Setup Page)	75°F or units 24.0°C	207 [float] rw	always
h.Pb [h.Pb]	*Loop* **Heat Proportional Band** Set the proportional band for the heat outputs.		0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	25.0°F or units 14.0°C	232 [float] rw	Heat Algorithm (Setup Page) is set to PID.
h.hy [h.hy]	*Loop* **Heat Hysteresis** Set the control switching hysteresis for on-off control. This determines how far into the "on" region the process value needs to move before the output turns on.		0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	3.0°F or units 2.0°C	234 [float] rw	Heat Algorithm (Setup Page) is set to On-Off.
C.Pb [C.Pb]	*Loop* **Cool Proportional Band** Set the proportional band for the cool outputs.		0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	25.0°F or units 14.0°C	238 [float] rw	Cool Algorithm (Setup Page) is set to PID.

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Display	Parameter name Description	Set-tings	Range	Default	Modbus* (less 40,001 offset) read/write	Appears If
C.hy [C.hy]	*Loop* **Cool Hysteresis** Set the control switching hysteresis for on-off control. This determines how far into the "on" region the process value needs to move before the output turns on.		0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	3.0°F or units 2.0°C	240 [float] rw	Cool Algorithm (Setup Page) is set to On Off.
t i [ti]	*Loop* **Time Integral** Set the PID integral for the outputs.		0.0 to 9,999.000 seconds per repeat	180.0 seconds per repeat	226 [float] rw	Heat Algorithm or Cool Algorithm (Setup Page) is set to PID.
t d [td]	*Loop* **Time Derivative** Set the PID derivative time for the heat outputs.		0.0 to 9,999.000 seconds	0.0 seconds	228 [float] rw	Heat Algorithm or Cool Algorithm (Setup Page) is set to PID.
db [db]	*Loop* **Dead Band** Set the offset to the proportional band. With a negative value, both heating and cooling outputs are active when the process value is near the set point. A positive value keeps heating and cooling outputs from fighting each other.		-1,000.0 to 1,000.0°F or units -555.0 to 555.5°C	0.0	230 [float] rw	Heat Algorithm and Cool Algorithm (Setup Page) is set to PID or On-Off.
o.SP [o.SP]	*Loop* **Open Loop Set Point** Set a fixed level of output power when in manual (open-loop) mode.		-100 to 100% (heat and cool) 0 to 100% (heat only) -100 to 0% (cool only)		23 rw	always
ALM1 oPEr **Alarm Menu**		1 ALM1 **Alarm 1**	2 ALM1 **Alarm 2**			
A.Lo [A.Lo]	*Alarm (1 or 2)* **Low Set Point** If Alarm Type (Setup Page, Alarm Menu) is set to: **process** - set the process value that will trigger a low alarm. **deviation** - set the span of units below the set point that will trigger a low alarm.		Process: -1,999.000 to 9,999.000°F or units 1,128.33 to 5,537.22°C Deviation: -1,999.000 to 9,999.000°F or units 1,110.56 to 5,555.56°C	32.0°F or units 0.0°C	99 [1 float] 115 [2 float] rw	Alarm Sides (Setup Page) is not set to High.
A.hi [A.hi]	*Alarm (1 or 2)* **High Set Point** If Alarm Type (Setup Page, Alarm Menu) is set to: **process** - set the process value that will trigger a high alarm. **deviation** - set the span of units above the set point that will trigger a high alarm.		Process: -1,999.000 to 9,999.000°F or units 1,128.33 to 5,537.22°C Deviation: -1,999.000 to 9,999.000°F or units 1,110.56 to 5,555.56°C	300.0°F or units 148.9°C	97 [1 float] 113 [2 float] rw	Alarm Sides (Setup Page) is not set to Low.
	Alarm (1 or 2) **Clear Request** Write to this register to clear an alarm state.		0		108 [1 unsigned] 124 [2 unsigned] write only	Modbus only
	Alarm (1 or 2) **Silence Request** Write to this register to clear an alarm state.		0		109 [1 unsigned] 125 [2 unsigned] write only	Modbus only

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Display	Parameter name Description	Set-tings	Range	Default	Modbus* (less 40,001 offset) read/write	Appears If
CUrr oPEr **Current Menu**			**NOTE: To use the current sensing feature, Time Base (Setup Page, Output Menu) must be set to 0.7 seconds or more.**			
C.hi [C.hi]	*Current* **High Set Point** Set the current value that will trigger a high Heater Error state.		-1,999.000 to 9,999.000	50.0	286 [float] rw	Current Sides (Setup Page) is set to High or Both.
C.Lo [C.Lo]	*Current* **Low Set Point** Set the current value that will trigger a low Heater Error state.		-1,999.000 to 9,999.000		288 [float] rw	Current Sides (Setup Page) is set to Low or Both.
CU.r [CU.r]	*Current* **Read** View the most recent current value monitored by the current transformer.		-1,999.000 to 9,999.000		38 [float] read only	always
C.Er [C.Er]	*Current* **Error** View the cause of the most recent load fault.		nonE None (61) Shrt Shorted (127) oPEn Open (65)		40 [unsigned] read only	always
h.Er [h.Er]	*Current* **Heater Error** View the cause of the most recent load fault monitored by the current transformer.		nonE None (61) h iGh High (37) LobJ Low (53)		282 [unsigned] read only	always
P.StA oPEr **Profile Status Menu** (menu appears if ST_ _ - _ _ _ _ - _ P _ _)				*** Some parameters in the Profile Status Menu can be changed for the currently running profile, but should only be changed by knowledgeable personnel and with caution. Changing parameters via the Profile Status Menu will not change the stored profile but will have an immediate impact on the profile that is running.** **Changes made to profile parameters in the Profiling Pages will be saved and will also have an immediate impact on the running profile.**		
P.Str {P.Str]	*Profile Status* **Profile Start** Select a step or profile to load.		0 to 40 (0: no profile is running)	0 (none)	292 [unsigned] rw	always
P.ACr {P.ACr]	*Profile Status* **Profile Action Request** Select what action to apply to the currently loaded profile.		nonE No Action (61) ProF Start a Profile (77) StEP Start a Step (89) PAUS Pause (146) rESU Resume (147) End End (148)	None	306 [unsigned] rw	always
StP [StP]	*Profile Status* **Active Step** View the currently running step.		1 to 40		296 [unsigned] read only	always.
S.tyP [S.typ]	*Profile Status* **Step Type** View the currently running step type.		UStP Unused Step t i Time rAtE Rate SoAH Soak LJE Wait Event LJPr Wait For Process LJbo Wait For Both JL Jump Loop End End	Unused Step		a file is running.

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Display	Parameter name Description	Set-tings	Range	Default	Modbus* (less 40,001 offset) read/write	Appears If
tgSP [tg.SP]	*Profile Status* **Target Set Point** View the target set point of the current step.		-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C			a file is running.
AC.SP [AC.SP]	*Profile Status* **Active Set Point** Display the current set point, even if the profile is ramping.		-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C		297 [float] read only	always
S.ti [S.ti]	*Profile Status* **Step Time Remaining** View the time remaining for the current step. Step is displayed in seconds. If the time exceeds 9,999 seconds, the display will show 9,999 and remain there while the control continues to decrement internally. Once the remaining time is equal to or less than 9,999 the display will represent the actual seconds remaining. As an example, if a three-hour soak time is currently being monitored, the first value displayed will be 9,999, and the display will remain at 9,999 until the remaining time is approximately equal to 2 hours and 46 minutes. At this point the display will track the actual seconds remaining.		0 to 9,999.000 seconds		303 [float] read only	always
Ent1 [Ent1] Ent2 [Ent2]	*Profile Status* **Event Output (1 or 2)** View the event output states of the current step.		oFF Off (62) on On (63)	Off	32 [1 unsigned] 33 [2 unsigned] read only	a file is running.
JC [JC]	*Profile Status* **Jump Count Remaining** View the jump counts remaining for the current loop. In a profile with nested loops, this may not indicate the actual jump counts remaining.		0 to 9,999		305 [unsigned] read only	always

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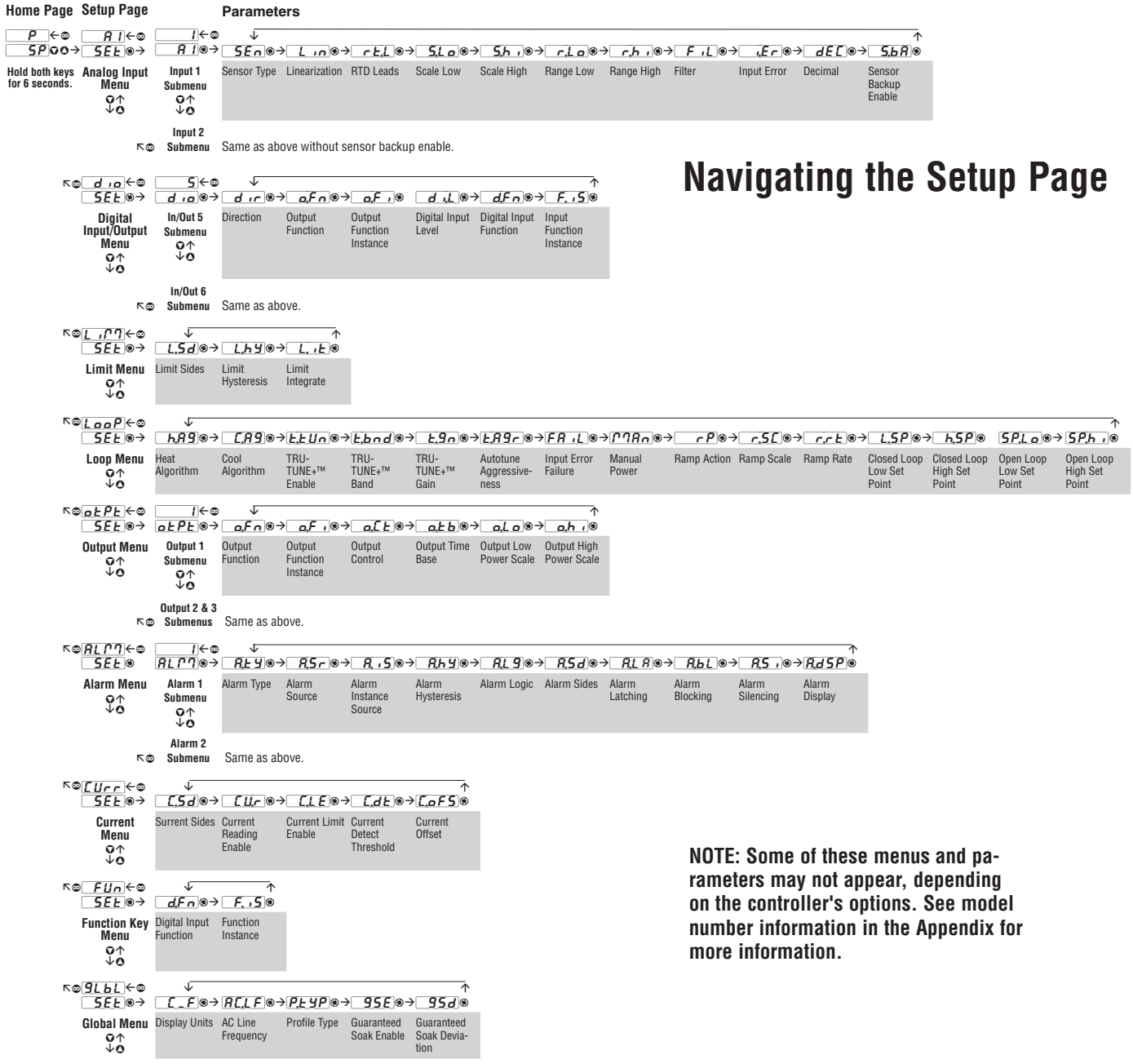
6 Chapter 6: Setup Page

To go to the Setup Page from the Home Page, press both the Up ▲ and Down ▼ keys for six seconds. A1 will appear in the upper display and SEt will appear in the lower display.

- Press the Up ▲ or Down ▼ key to move through the menus.
- Press the Advance Key ◉ to move to a submenu.
- Press the Up ▲ or Down ▼ key to move through the submenus.
- Press the Advance Key ◉ to move through the parameters of the submenu.
- Press the Infinity Key ∞ to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.
- Press and hold the Infinity Key ∞ for two seconds to return to the Home Page.

Navigating the Setup Page



NOTE: Some of these menus and parameters may not appear, depending on the controller's options. See model number information in the Appendix for more information.

Display	Parameter Name Description	Set-tings	Range (Integer values for Modbus in parenthesis.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
A1 SEt		1 A1	2 A2			
Analog Input Menu	**Analog Input 1**		**Analog Input 2** (Analog input 2 appears it ST_L-_ _ _ _-_ _ _ _)			
SEn [SEn]	*Input (1 or 2)* **Sensor Type** Set the analog sensor type to match the device wired to this input. **NOTE: There is no open-sensor detection for process inputs.**		oFF Off (62) tC Thermocouple (95) mV Millivolts (56) volt Volts dc (104) mA Milliamps dc (112) r0.1H RTD 100 Ω (113) r1.0H RTD 1,000 Ω (114)	thermo-couple	42 [1 unsigned] 70 [2 unsigned] rw	always
Lin [Lin]	*Input (1 or 2)* **Linearization** Set the linearization to match the thermocouple wired to this input.		b B (11) C C (15) d D (23) E E (26) F F (30) J J (46) K K (48) n N (58) r R (80) S S (84) t T (93)	J	43 [1 unsigned] 71 [2 unsigned] rw	Sensor Type is set to Thermo-couple.
rtL [rt.L]	*Input (1 or 2)* **RTD Leads** Set to match the number of leads on the RTD wired to this input.		2 2 (1) 3 3 (2)	2	44 [1 unsigned] 72 [2 unsigned] rw	Sensor Type is set to RTD 100 Ω or RTD 1,000 Ω.
SLo [S.Lo]	*Input (1 or 2)* **Scale Low** Set the low scale for process inputs. This value, in millivolts, volts or milliamps will correspond to the Range Low value displayed by the controller.		-100.0 to 100.0	0.0	57 [1 float] 85 [2 float] rw	Sensor Type is set to Millivolts,Volts or Milliamps.
Shi [S.hi]	*Input (1 or 2)* **Scale High** Set the high scale for process inputs. This value, in millivolts, volts or milliamps will correspond to the Range High value displayed by the controller.		-100.0 to 100.0	20	59 [1 float] 87 [2 float] rw	Sensor Type is set to Millivolts,Volts or Milliamps.
rLo [r.Lo]	*Input (1 or 2)* **Range Low** Set the low range for the displayed process input units.		-1,999.000 to 9,999.000	0	61 [1 float] 89 [2 float] rw	Sensor Type is set to Millivolts,Volts or Milliamps.
rhi [r.hi]	*Input (1 or 2)* **Range High** Set the high range for the displayed process input units.		-1,999.000 to 9,999.000	9,999.0	63 [1 float] 91 [2 float] rw	Sensor Type is set to Millivolts,Volts or Milliamps.
FiL [FiL]	*Input (1 or 2)* **Filter Time** Filtering smooths out the process signal to both the display and the input. Increase the time to increase filtering.		0.0 to 60.0 seconds	0.5	55 [1 float] 83 [2 float] rw	always
iEr [i.Er]	*Input (1 or 2)* **Error Latching** Turn input error latching on or off. If latching is on errors must be manually cleared.		oFF Off (62) on On (63)	Off	67 [1 unsigned] 95 [2 unsigned] rw 69 [unsigned]	always Modbus only
dEC [dEC]	*Input (1 or 2)* **Decimal** Set the precision of the displayed value.		0 Whole 0.0 Tenths 0.00 Hundreths 0.000 Thousandths	Whole		always

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Display	Parameter Name Description	Set-tings	Range (Integer values for Modbus in parenthesis.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
S.bA [S.bA]	*Input 1* **Sensor Backup Enable** If the input 1 sensor fails, the controller will use the input 2 sensor.		oFF Off (62) on On (63)	Off	65 [1 unsigned] rw	the controller includes a limit (ST_L-____-____).
	Input (1 or 2) **Error Reset** Write to this register to clear an error state.		0		68 [1 unsigned] 96 [2 unsigned] write only	Modbus only
d io SEt **Digital Input/ Output Menu** **(menu appears if ST (B, E, D or C)_-____-____)**	5 d io **Digital Input Output 5**	6 d io **Digital Input Output 6**		**WARNING: When the controller is powered up, the outputs may turn on.**		
d ir [dir]	*Digital Input/Output (5 or 6)* **Direction** Set the function to an input or output.		OtPt Output (68) in Input Voltage (193) iCon Input Dry Contact (44)	Output	169 [5 unsigned] 182 [6 unsigned] rw	always
o.Fn [o.Fn]	*Digital Output (5 or 6)* **Function** Select what function will drive this output.		oFF Off (62) ALrM Alarm (6) Ent Event (29)	Off	173 [5 unsigned] 186 [6 unsigned] rw	Direction is set to Output.
o.F i [o.Fi]	*Digital Output (5 or 6)* **Function Instance** Select which source instance will drive the output.		1 or 2	(5) 1 (6) 2	174 [5 unsigned] 187 [6 unsigned] rw	Direction is set to Output.
d iL [di.L]	*Digital Input (5 or 6)* **Level** Select what action will be interpreted as a true state.		High High (37) Lolo Low (53)	High	264 [1 unsigned] 268 [2 unsigned] rw	Direction is set to Input Voltage or Input Dry Contact.
d.Fn [d.Fn]	*Digital Input (5 or 6)* **Function** Select the function that will be triggered by a true state. Functions respond to a level state change or an edge level change.		nonE None (61) idLE Idle Set Point Enable [level] (107) tUnE Tune [edge] (98) ALrM Alarm Reset [edge] (6) Si L Silence Alarms [edge] (108) mnAn Manual/Auto Mode [level] (54) oFF Control Outputs Off [level] (90) Pd iS Profile Disable [level] (206) PhoL Profile Hold/Resume [level] (207) ProF Profile Start Number [edge] (79) PStS Profile Start/Stop [level] (208) LrMr Limit Reset [edge] (82)	None	266 [1 unsigned] 270 [2 unsigned] rw	Direction is set to Input Voltage or Input Dry Contact.

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Display	Parameter Name Description	Set-tings	Range (Integer values for Modbus in parenthesis.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
F.iS [F.iS]	*Digital Input (5 or 6)* **Function Instance** Select which instance of the Event Function will be triggered by a true state.		0 All Instances (except profiles) (For example, if Digital Function is set to Silence Alarms and Function Instance is set to 0, then this digital input will silence both alarms.) 1 to 4	1	267 [1 unsigned] 271 [2 unsigned] rw	Direction is set to Input Voltage or Input Dry Contact.
LIM7 SEt **Limit Menu**	**(menu appears if (ST_L-____-___).**					
L.Sd [L.Sd]	*Limit* **Sides** Select which side or sides of the process value will be monitored.		both Both (13) h.9h High (37) Lolo Low (53)	Both	279 [unsigned] rw	always
L.hy [L.hy]	*Limit* **Hysteresis** Set the hysteresis for the limit function. This determines how far into the safe range the process value must move before the limit turns the output back on.		0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	1.0	273 [float] rw	always
L.it [L.it]	*Limit* **Integrate** In a limit state the controller will turn off the outputs, terminate an active profile and freeze PID and TRU-TUNE+™ calculations.		no No (59) YES Yes (106)	No	316 [unsigned] rw	always
LooP SEt **Loop Menu**						
h.Ag [h.Ag]	*Loop* **Heat Algorithm** Set the heat control method.		oFF Off (62) P.id PID (71) on.oF On-Off (64)	PID	223 [unsigned] rw	always
C.Ag [C.Ag]	*Loop* **Cool Algorithm** Set the cool control method.		oFF Off (62) P.id PID (71) on.oF On-Off (64)	Off	224 [unsigned] rw	always
t.tUn [t.tun]	*Loop* **TRU-TUNE+™ Enable** Enable or disable the TRU-TUNE+™ adaptive tuning feature.		no No (59) YES Yes (106)	No	257 [unsigned] rw	Cool Algorithm or Heat Algorithm is set to PID.
t.bnd [t.bnd]	*Loop* **TRU-TUNE+™ Band** Set the range, centered on the set point, within which TRU-TUNE+™ will be in effect. Use this function only if the controller is unable to adaptive tune automatically.		0 Auto 1 to 100	0	307 [unsigned] rw	Cool Algorithm or Heat Algorithm is set to PID and TRU-TUNE+™ Enable is set to Yes.
t.gn [t.gn]	*Loop* **TRU-TUNE+™ Gain** Select the responsiveness of the TRU-TUNE+™ adaptive tuning calculations. More responsiveness may increase overshoot.		1 to 6 Most to least responsive	3	308 [unsigned] rw	Cool Algorithm or Heat Algorithm is set to PID and TRU-TUNE+™ Enable is set to Yes.

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Display	Parameter Name Description	Set-tings	Range (Integer values for Modbus in parenthesis.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
t.Agr [t.Agr]	*Loop* **Autotune Aggressiveness** Select the aggressiveness of the auto-tuning calculations.		Undr Under (99) Cr it Critical (21) OuEr Over (69)	Critical	259 [unsigned] rw	Cool Algorithm or Heat Algo-rithm is set to PID.
FAiL [FAiL]	*Loop* **Input Error Failure** Select what the controller will do when an error is detected and control changes to manual mode.		oFF Off, sets output power to 0% (62) bPLS Bumpless, main-tains same output power, if it was less than 75% and stable, otherwise 0% (14) MAn Manual Fixed, sets output power to Manual Power setting (54) USEr User, sets output power to last open-loop set point the user entered (100)	User	214 [unsigned] rw	always
MAn [MAn]	*Loop* **Manual Power** Set the manual output power level that will take effect if an input error failure occurs.		Set Point Open Loop Limit Low to Set Point Open Loop Limit High	0.0	211 [float] rw	Input Error Failure is set to Fixed.
rP [rP]	*Loop* **Ramp Action** Select when the controller's set point will ramp to the defined end set point.		oFF Off (62) Str Startup (88) StPt Set Point (85) both Both (13)	Off	215 [unsigned] rw	always
r.SC [r.SC]	*Loop* **Ramp Scale** Select the scale of the ramp rate.		hour Hours (39) MnUn Minutes (57)	Minutes	216 [unsigned] rw	Ramp Action is set to Startup, Set Point or both.
r.rt [r.rt]	*Loop* **Ramp Rate** Set the rate for the set point ramp. Set the time units for the rate with the Ramp Scale parameter.		0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	1.0	219 [float] rw	Ramp Action is set to Startup, Set Point or both.
L.SP [L.SP]	*Loop* **Closed Loop Low Set Point** Set the minimum value of the closed-loop set point range..		-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	-1,999.000	195 [float] rw	always
h.SP [h.SP]	*Loop* **Closed Loop High Set Point** Set the maximum value of the closed-loop set point range.		-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	9,999.000	197 [float] rw	always
	Loop **Closed Loop Active Set Point**		-1,999 to 9,999		203 [float] read only	Modbus only
SP.hi [SP.hi]	*Loop* **Open Loop High Set Point** Set the maximum value of the open-loop set point range.		-1,999 to 9,999		201 [float] read only	Modbus only
SP.Lo [SP.Lo]	*Loop* **Open Loop Low Set Point** Set the minimum value of the open-loop set point range.		-1,999 to 9,999		199 [float] read only	Modbus only

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Display	Parameter Name Description	Settings	Range (Integer values for Modbus in parenthesis.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
	Loop **User Action Failure**		-1,999 to 9,999		203 [unsigned] read only	Modbus only
oUPt SEt **Output Menu**		1 oUPt **Output 1**	2 oUPt **Output 2**	3 oUPt **Output 3**	**WARNING: When the controller is powered up, the outputs may turn on.**	
oFn [o.Fn]	*Output (1 to 3)* **Function** Select what the output will control.		oFF Off (62) HEAt Heat (36) Cool Cool (20) ALRM Alarm (6) Ent Event (29) (2 & 3 only) LiMM Limit (126) (3 only)	Heat (1) Alarm (2) Off (3 to 6)	134 [1 unsigned] 147 [2 unsigned] 160 [3 unsigned] rw	1 and 2 always, 3 if the controller includes a limit (ST_L-_ _ _ _-_ _ _ _).
oFi [o.Fi]	*Output (1 to 3)* **Function Instance** Select which instance will be associated with this output.		1 or 3	1	135 [1 unsigned] 148 [2 unsigned] 161 [3 unsigned] rw	1 and 2 always, 3 if the controller includes a limit (ST_L-_ _ _ _-_ _ _ _).
oCt [o.Ct]	*Output (1 to 3)* **Control** Set the output control type. This parameter is only used with PID control, but can be set anytime.		FtB Fixed Time Base (34) vtB Variable Time Base (103)	Fixed Time Base	131 [1 unsigned] 144 [2 unsigned] 157 [3 unsigned] rw	1 and 2 always, 3 if the controller includes a limit (ST_L-_ _ _ _-_ _ _ _).
otb [o.tb]	*Output (1 to 3)* **Time Base** Set the time base for fixed-time-base control.		0.1 to 60.0 seconds	0.1 sec. [SSR] 5.0 sec. [relay]	132 [1 float] 145 [2 float] 158 [3 float] rw	1 and 2 always, 3 if the controller includes a limit (ST_L-_ _ _ _-_ _ _ _) and Time Base is set to Fixed Time Base.
olo [o.Lo]	*Output (1 to 3)* **Low Power Scale** The power output will never be less than the value specified and will represent the value at which output scaling begins.		0.0 to 100.0%	0.0%	139 [1 float] 152 [2 float] 165 [3 float] rw	1 and 2 always, 3 if the controller includes a limit (ST_L-_ _ _ _-_ _ _ _) and if Source is set to Heat or Cool.
ohi [o.hi]	*Output (1 to 3)* **High Power Scale** The power output will never be greater than the value specified and will represent the value at which output scaling stops.		0.0 to 100.0%	100.0%	141 [1 float] 154 [2 float] 167 [3 float] rw	1 and 2 always, 3 if the controller includes a limit (ST_L-_ _ _ _-_ _ _ _) and if Source is set to Heat or Cool.
ALRM SEt **Alarm Menu**		1 ALRM **Alarm 1**	2 ALRM **Alarm 2**			
Aty [A.ty]	*Alarm (1 or 2)* **Type** Select how the alarm will or will not track the set point.		oFF Off (62) PrAL Process Alarm (76) dEAL Deviation Alarm (24)	Process Alarm	110 [1 unsigned] 126 [2 unsigned] rw	always
ASr [A.Sr]	*Alarm (1 or 2)* **Source** Select what will trigger this alarm.		Ai Analog Input (142) PwJr Power (73) (process only) CUrr Current (22) (process only)	Analog Input	111 [1 unsigned] 127 [2 unsigned] rw	always

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*** Low register numbers contain the two lower bytes; high register numbers contain the two higher bytes of the four-byte floating-point value.**

Display	Parameter Name Description	Set-tings	Range (Integer values for Modbus in parenthesis.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
A.iS [A.iS]	*Alarm (1 or 2)* **Source Instance** If Alarm Source is set to input, select which input to use.		1 or 2	1	112 [1 unsigned] 128 [2 unsigned] rw	always
A.hy [A.hy]	*Alarm (1 or 2)* **Hysteresis** Set the hysteresis for an alarm. This determines how far into the safe region the process value needs to move before the alarm can be cleared.		0.001 to 9,999.000°F or units 0.001 to 5,555.000°C	1.0	101 [1 float] 117 [2 float] rw	always
A.Lg [A.Lg]	*Alarm (1 or 2)* **Logic** Select what the output condition will be during in the alarm state.		AL.C Close On Alarm (17) AL.o Open On Alarm (66)	Close On Alarm	104 [1 unsigned] 120 [2 unsigned] rw	always
A.Sd [A.Sd]	*Alarm (1 or 2)* **Sides** Select which side or sides will trigger this alarm.		both Both (13) h.Sh High (37) Lolo Low (53)	Both	103 [1 unsigned] 119 [2 unsigned] rw	always
A.LA [A.LA]	*Alarm (1 or 2)* **Latching** Turn alarm latching on or off. A latched alarm has to be turned off by the user.		nLAt Non-Latching (60) LAt Latching (49)	Non-Latching	106 [1 unsigned] 122 [2 unsigned] rw	always
A.bL [A.bL]	*Alarm (1 or 2)* **Blocking** Select when an alarm will be blocked. After startup and/or after the set point changes, the alarm will be blocked until the process value enters the normal range.		oFF Off (62) Str Startup (88) StPt Set Point (85) both Both (13)	Off	107 [1 unsigned] 123 [2 unsigned] rw	always
A.Si [A.Si]	*Alarm (1 or 2)* **Silencing** Turn alarm silencing on to allow the user to disable this alarm.		oFF Off (62) on On (63)	Off	105 [1 unsigned] 121 [2 unsigned] rw	always
A.dSP [A.dSP]	*Alarm (1 or 2)* **Display** Display an alarm message when an alarm is active.		oFF Off on On	On		always
CUrr SEt **Current Menu**			**(menu appears if ST (P, E, J or C) _-_ _ _ -_ _ _ _)**	**NOTE: To use the current sensing feature, Time Base (Setup Page, Output Menu) must be set to 0.7 seconds or more.**		
C.Sd [C.Sd]	*Current* **Sides** Select which side of the current to monitor.		oFF Off (62) h.Sh High (37) Lolo Low (53) both Both (13)	Off	283 [unsigned] rw	always
CU.r [CU.r]	*Current* **Reading Enable** Display solid-state relay (SSR) failure and heater failure messages on the RUI (remote user interface).		no No YES Yes	No		always
C.LE [C.LE]	*Current* **Limit Enable** Trip the limit if a shorted solid-state relay (SSR) is detected.		no No (59) YES Yes (106)	No	284 [unsigned] rw	the controller includes a limit (ST_L -_ _ _ -_ _ _ _).

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Display	Parameter Name Description	Set-tings	Range (Integer values for Modbus in parenthesis.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
C.dt [C.dt]	*Current* **Detect Threshold** For factory adjustment only.		0 to 32,767	12	285 [unsigned]	the controller includes a limit (ST_L -_ _ _ _-_ _ _ _).
C.oFS [C.oFS]	*Current* **Offset** Calibrate the current reading with an offset value.		-1,999 to 9,000	0		the controller includes a limit (ST_L -_ _ _ _-_ _ _ _).
Fun SEt	**Function Key (EZ Key) Menu**					
d.Fn [d.Fn]	*Function (EZ) Key* **Digital Input Function** Program the EZ Key to trigger an action.		nonE None (61) idLE Idle Set Point Enable [level] (107) tUnE Tune [edge] (98) ALrM Alarm Reset [edge] (6) S_iL Silence Alarms [edge] (108) MnAn Manual/Auto Mode [level] (54) oFF Control Outputs Off [level] (90) Pd_S Profile Disable [level] (206) P.hoL Profile Hold/Resume [level] (207) ProF Profile Start Number [edge] (79) PStS Profile Start/Stop [level] (208) LrMr Limit Reset [edge] (82)	None		always
F.iS [F.iS]	*Function (EZ) Key* **Instance** Select which instance the EZ Key will affect. If only one instance is available, any selection will affect it.		0 All Instances (except Profile) (For example, if Digital Function is set to Silence Alarms and Function Instance is set to 0, then the digital input would silence both alarms.) 1 to 4	**1**		always
GLbL SEt	**Global Menu**					
C_F [C_F]	*Global* **Display Units** Select which units will be displayed.		F °F C °C	°F		always
AC.LF [AC.LF]	*Global* **AC Line Frequency** Set the frequency to the applied ac line power source.		50 50 Hz (3) 60 60 Hz (4)	60 Hz	129 [unsigned] rw	always

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Display	Parameter Name Description	Set-tings	Range (Integer values for Modbus in parenthesis.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
PtyP [P.tyP]	*Global* **Profile Type** Set the profile startup to be based on a set point or a process value.		StPt Set Point (85) Pro Process (75)	Set Point	302 [unsigned] rw	the controller includes profiling (ST_ _-_ _ _ _-_ P _ _).
gSE [gSE]	*Global* **Guaranteed Soak Enable** Enables the guaranteed soak deviation function in profiles.		oFF Off (62) on On (63)	Off	299 [unsigned] rw	the controller includes profiling (ST_ _-_ _ _ _-_ P _ _).
gSd [gSd]	*Global* **Guaranteed Soak Deviation** Set the value of the deviation band that will be used in all profile step types. The process value must enter the deviation band before the step can proceed.		0.0 to 9,999.000°F or units 0.0 to 5,555.000°C	10.0°F or units 6.0°C	300 [float] rw	the controller includes profiling (ST_ _-_ _ _ _-_ P _ _).

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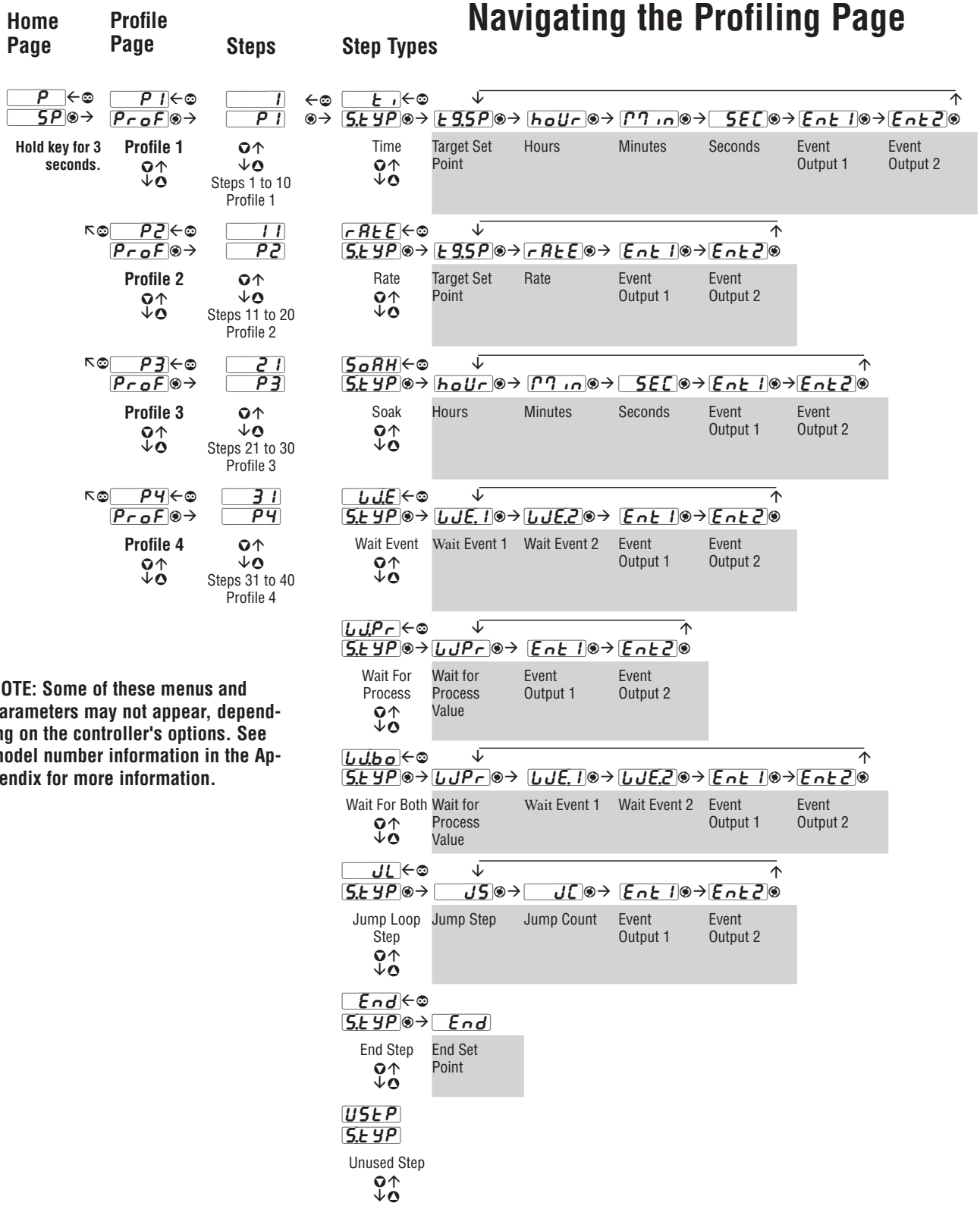
*** Low register numbers contain the two lower bytes; high register numbers contain the two higher bytes of the four-byte floating-point value.**

7 Chapter 7: Profiling Page

Navigating the Profiling Page



NOTE: Some of these menus and parameters may not appear, depending on the controller's options. See model number information in the Appendix for more information.

The Profiling Page allows you to enter your ramp and soak profile information.

To go to the Profiling Page from the Home Page, press the Advance Key for three seconds, until [PrOF] appears in the lower display and the profile number appears in the upper display. Press the Up or Down key to change to another profile.

- Press the Advance Key to move to the selected profile's first step.
- Press the Up or Down keys to move through the steps.
- Press the Advance Key to move through the selected step's settings.
- Press the Up or Down keys to change the step's settings.
- Press the Infinity Key at any time to return to the step number prompt.
- Press the Infinity Key again to return to the profile number prompt.
- From any point press and hold the Infinity Key for two seconds to return to the Home Page.

Note: Changes made to profile parameters in the Profiling Pages will be saved and will also have an immediate impact on the running profile.

Some parameters in the Profile Status Menu can be changed for the currently running profile, but should only be changed by knowledgeable personnel and with caution. Changing parameters via the Profile Status Menu will not change the stored profile but will have an immediate impact on the profile that is running.

How to Start a Profile

After defining the profile follow the steps below to run the profile:

1. From the Home Page push the Advance Key repeatedly until Profile Start [P.St 1] appears in the lower display.
2. Use the Up or Down key to choose the file or step number within a profile where you want the profile to begin running.
3. Press the Advance Key. This takes you to Profile Action [P.Ac 1], where you can select the appropriate action.
   - [nonE] No action
   - [PrOF] Begin execution from first step of the specified profile number, whether it exists or not.
   - [PAUS] Pause the currently running profile.
   - [rESU] Resume running the profile from the previously paused step.
   - [End] End the profile.
   - [StEP] Begin running the profile from the specified step number.

Display	Parameter name Description	Settings	Range (Integer values for Modbus in parentheses.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
Profiling parameters appear if the controller includes profiling **(ST_ _-_ _ _ _-_P_ _)**.						
[PrOF] [ProF]	**Profile** Select the profile to be edited or viewed.		P1 to P4	1	295 [unsigned] rw	always
[P1] [P1] to [P4] [P4]	**Step** Select a step to edit or view.		1 to 10 [profile 1] 11 to 20 [profile 2] 21 to 30 [profile 3] 31 to 40 [profile 4]		296 [unsigned] rw	always
[S.typ] [S.typ]	**Step Type** Select a step type.		[USEP] Unused Step [t i] Time [rAtE] Rate [SoAH] Soak [LJE] Wait For Event [LJPr] Wait For Process [LJbo] Wait For Both [JL] Jump Loop [End] End	Unused	500 [unsigned] rw address = 500 + ((instance - 1} * 20)	always
[tg.SP] [tg.SP]	*Step Type Parameters* **Target Set Point** Select the set point for this step.		-1,999.000 to 9,999.000°F or units -1,128 to 5,537.000°C	0.0°F or units -18°C	501 [unsigned] rw address = 501 + ((instance - 1} * 20)	Step Type is set to Time, Rate, Wait for Process or Wait for Both.

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Display	Parameter name Description	Set-tings	Range (Integer values for Modbus in parentheses.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
hoUr [hoUr]	*Step Type Parameters* **Hours** Select the hours (plus Minutes and Seconds) for a timed step.		0 to 99	0	503 [unsigned] rw address = 503 + ((instance - 1} * 20)	Step Type is set to Time or Soak.
MIn [Min]	*Step Type Parameters* **Minutes** Select the minutes (plus Hours and Seconds) for a timed step.		0 to 59	0	504 [unsigned] rw address = 504 + ((instance - 1} * 20)	Step Type is set to Time or Soak.
SEC [SEC]	*Step Type Parameters* **Seconds** Select the seconds (plus Hours and Minutes) for a timed step.		0 to 59	0	505 [unsigned] rw address = 505 + ((instance - 1} * 20)	Step Type is set to Time or Soak.
rAtE [rAtE]	*Step Type Parameters* **Rate** Select the rate for ramping in degrees or units per minute.		0 to 9,999.000°F or units per minute 0 to 5,555.000°C per minute	0.0	506 [unsigned] rw address = 506 + ((instance - 1} * 20)	Step Type is set to Rate.
WPr [WPr]	*Step Type Parameters* **Wait For Process Value** The step will wait until the process value is equal to the Wait-for Process Value. Once the Wait For Process is satisfied, this step ends.		-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C	0.0°F or units -18.0°C	512 [unsigned] rw address = 512 + ((instance - 1} * 20)	Step Type is set to Wait For Process.
WE.1 [WE.1] or WE.2 [WE.2]	*Step Type Parameters* **Wait Event (1 and 2)** Select the event state that must be satisfied during this step. Digital input 5 provides the state of Event 1, and digital input 6 provides the state of Event 2.		oFF Off on On nonE None	Off	510 [unsigned] rw address = 510 + ((instance - 1} * 20) 511 [unsigned] rw address = 511 + ((instance - 1} * 20)	Step Type is set to Wait Event or Wait for Both.
JS [JS]	*Step Type Parameters* **Jump Step** Select a step to jump to.		1 to 40	0	514 [unsigned] rw address = 514 + ((instance - 1} * 20)	Step Type is set to Jump Loop.
JC [JC]	*Step Type Parameters* **Jump Count** Set the number of jumps. A value of 0 creates an infinite loop. Loops can be nested four deep.		0 to 9,999	0	515 [unsigned] rw address = 515 + ((instance - 1} * 20)	Step Type is set to Jump Loop.
End [End]	*Step Type Parameters* **End Type** Select what the controller will do when this profile ends.		oFF Control Mode set to Off Hold Hold last closed-loop set point in the profile USEr User, reverts to previous set point	User	516 [unsigned] rw address = 516 + ((instance - 1} * 20)	Step Type is set to End.
Ent1 [Ent1] or Ent2 [Ent2]	*Step Type Parameters* **Event Output (1 and 2)** Select whether Event Output 1 or 2 is on or off during this step.		oFF Off on On	Off	508 [1 unsigned] rw address = 508 + ((instance - 1} * 20) 509 [1 unsigned] rw address = 509 + ((instance - 1} * 20)	Step Type is set to Time, Rate, Soak, Wait Event, Wait for Process, Wait for Both or Jump Loop.

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Calculating the Modbus Address for a Step

Each Step Type parameter has 40 Modbus addresses, one for each of the 40 instances, or steps. To find a specific address: subtract 1 from the instance and multiply the sum by 20, then add that to the Modbus address listed in the table above.

For instance, the Modbus address for the Event Output 2 parameter for Step 21 = 509 + ((21 - 1) * 20), or 909.

The table on the next page, Modbus Registers for Profiling Parameters, lists all of the Modbus addresses for Step Type Parameters.

Display	Step Type name Description	Parameters in Step Type
ti [ti]	**Time** A Time Step controls at the Target Set Point and maintains two Event states for the designated time.	tSP Target Set Point hour Hours Min Minutes SEC Seconds Ent1 Event Output 1 Ent2 Event Output 2
rAtE [rAtE]	**Rate** A Rate Step ramps the process value to the Target Set Point in degrees per minute while maintaining two Event states.	tSP Target Set Point rAtE Rate Ent1 Event Output 1 Ent2 Event Output 2
SoAK [SoAk]	**Soak** A Soak Step maintains the last Target Set Point and two Event states for the designated time.	hour Hours Min Minutes SEC Seconds Ent1 Event Output 1 Ent2 Event Output 2
WtE [W.E]	**Wait For Event** A Wait Event Step will wait for the event states to match the two Wait Event settings.	WtE1 Wait Event 1 WtE2 Wait Event 2 Ent1 Event Output 1 Ent2 Event Output 2
WtPr [W.Pr]	**Wait For Process** If Wait-for Process Enable is on, a Wait for Process Step will wait for the process value to match the Wait for Process value.	WtPr Wait For Process Ent1 Event Output 1 Ent2 Event Output 2
Wtbo [W.bo]	**Wait For Both** If Wait-for Process Enable is on, a Wait for Both Step will wait for the process value to match the Target Set Point and for the event states to match the two Event settings	WtPr Wait for Process Value WtE1 Wait Event 1 WtE2 Wait Event 2 Ent1 Event Output 1 Ent2 Event Output 2
JL [JL]	**Jump Loop** A Jump Loop step will jump to the Jump Step the number of times designated in Jump Count. Loops can be nested up to four deep.	JS Jump Step JC Jump Count Ent1 Event Output 1 Ent2 Event Output 2
End [End]	**End** An End Step will end the profile. If a profile doesn't include an End Step, control will move to the next step. If no End Step is confronted, after step 40 control will default to the set point in effect before the profile started.	End End Type
USTP [UStP]	**Unused Step** This is an empty step that can be used to, in effect, erase a step in a profile.	

Modbus Registers for Profiling Parameters

	Profile 1										Profile 2									
	Step1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Step Type	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880
Unused Step (50)																				
Time (143)																				
Rate (81)																				
Soak (87)																				
Wait Event (144)																				
Wait Process (209)																				
Wait for Both (210)																				
Jump Loop (116)																				
End (27)																				
Target Set Point	501	521	541	561	581	601	621	641	661	681	701	721	741	761	781	801	821	841	861	881
-1,999.000 to 9,999.000																				
Hours	503	523	543	563	583	603	623	643	663	683	703	723	743	763	783	803	823	843	863	883
0 to 99																				
Minutes	504	524	544	564	584	604	624	644	664	684	704	724	744	764	784	804	824	844	864	884
0 to 59																				
Seconds	505	525	545	565	585	605	625	645	665	685	705	725	745	765	785	805	825	845	865	885
0 to 59																				
Rate	506	526	546	566	586	606	626	646	666	686	706	726	746	766	786	806	826	846	866	886
0 to 9999																				
Event Output 1	508	528	548	568	588	608	628	648	668	688	708	728	748	768	788	808	828	848	868	888
Off (62)																				
On (63)																				
Event Output 2	509	529	549	569	589	609	629	649	669	689	709	729	749	769	789	809	829	849	869	889
Off (62)																				
On (63)																				
Wait Event 1	510	530	550	570	590	610	630	650	670	690	710	730	750	770	790	810	830	850	870	890
Off (62)																				
On (63)																				
None (61)																				
Wait Event 2	511	531	551	571	591	611	631	651	671	691	711	731	751	771	791	811	831	851	871	891
Off (62)																				
On (63)																				
None (61)																				
Wait For Process	512	532	552	572	592	612	632	652	672	692	712	732	752	772	792	812	832	852	872	892
-1,999.000 to 9,999.000																				
Jump Step	514	534	554	574	594	614	634	654	674	694	714	734	754	774	794	814	834	854	874	894
0 to 40																				
Jump Count	515	535	555	575	595	615	635	655	675	695	715	735	755	775	795	815	835	855	875	895
0 to 9,999																				
End Type	516	536	556	576	596	616	636	656	676	696	716	736	756	776	796	816	836	856	876	896
Off (62)																				
Hold (47)																				
User (100)																				

Profile 3										Profile 4									
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
900	920	940	960	980	1000	1020	1040	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
901	921	941	961	981	1001	1021	1041	1061	1081	1101	1121	1141	1161	1181	1201	1221	1241	1261	1281
903	923	943	963	983	1003	1023	1043	1063	1083	1103	1123	1143	1163	1183	1203	1223	1243	1263	1283
904	924	944	964	984	1004	1024	1044	1064	1084	1104	1124	1144	1164	1184	1204	1224	1244	1264	1284
905	925	945	965	985	1005	1025	1045	1065	1085	1105	1125	1145	1165	1185	1205	1225	1245	1265	1285
906	926	946	966	986	1006	1026	1046	1066	1086	1106	1126	1146	1166	1186	1206	1226	1246	1266	1286
908	928	948	968	988	1008	1028	1048	1068	1088	1108	1128	1148	1168	1188	1208	1228	1248	1268	1288
909	929	949	969	989	1009	1029	1049	1069	1089	1109	1129	1149	1169	1189	1209	1229	1249	1269	1289
910	930	950	970	990	1010	1030	1050	1070	1090	1110	1130	1150	1170	1190	1210	1230	1250	1270	1290
911	931	951	971	991	1011	1031	1051	1071	1091	1111	1131	1151	1171	1191	1211	1231	1251	1271	1291
912	932	952	972	992	1012	1032	1052	1072	1092	1112	1132	1152	1172	1192	1212	1232	1252	1272	1292
914	934	954	974	994	1014	1034	1054	1074	1094	1114	1134	1154	1174	1194	1214	1234	1254	1274	1294
915	935	955	975	995	1015	1035	1055	1075	1095	1115	1135	1155	1175	1195	1215	1235	1255	1275	1295
916	936	956	976	996	1016	1036	1056	1076	1096	1116	1136	1156	1176	1196	1216	1236	1256	1276	1296

Profile Example Using Modbus

Profile	Step	Parameter	Modbus Address (less 40,001 offset)	Value	Comments
2	11	Wait Event	700	144	The first step in Profile 2 will be a Wait Event step.
		Wait Event 1	710	63	Wait for event 1 to be on.
		Wait Event 2	711	61	Wait for event 2 to be off.
		Event Output 1	708	62	Set Event 1 to Off.
		Event Output 2	709	63	Set Event 2 to On.
	12	Wait For Process	720	209	The second step will be a Wait for Process step.
		Target Set Point	721	100	Wait for the process value to reach 100.
		Event Output 1	728	63	Set Event 1 to On.
		Event Output 2	729	62	Set Event 2 to Off.
	13	Soak	740	87	The third step will be a Soak step.
		Hour	743	1	Set the soak time for one hour, one minute and one second.
		Minutes	744	1	
		Seconds	745	1	
		Event Output 1	748	62	Set Event 1 to Off.
		Event Output 2	749	63	Set Event 2 to On.
	14	End	760	27	The fourth step will be an End step.
		End Type	776	100	At the end of the profile the controller will revert to the set point that was in effect before the profile began.

Modbus Registers for Controlling and Monitoring a Profile

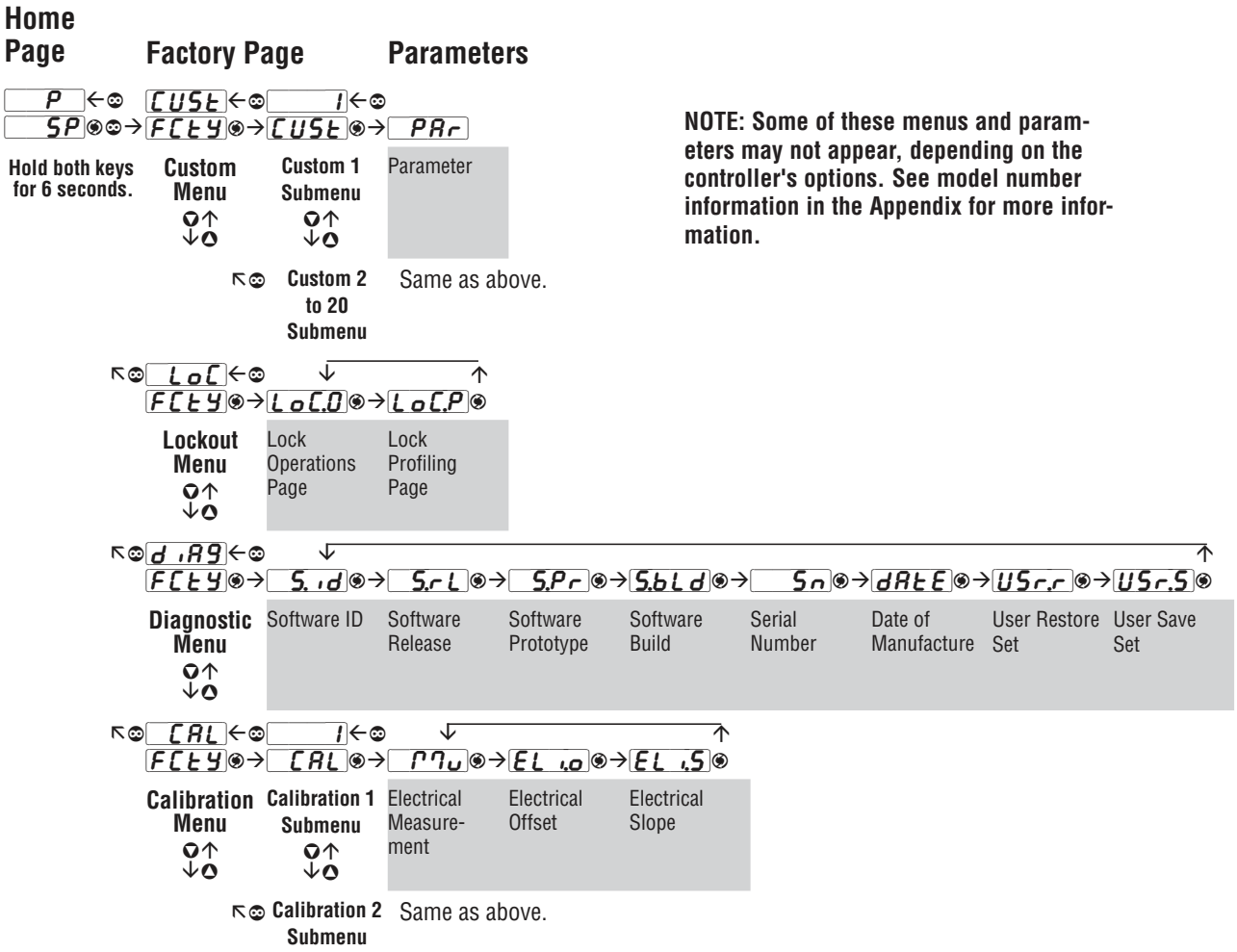
Function	Range (Integer values for Modbus in parentheses.)	Modbus Address (less 40,001 offset) Read/Write
Profile Start	1 to 40	292 [unsigned] rw
Monitor Profile State	Off (62) Running (149) Pause (146)	294 [unsigned] read only
Monitor Current File	0 to 40	295 [unsigned] read only
Active Step	0 to 40	296 [unsigned] read only
Active Set Point	-1,999.000 to 9,999.000°F or units 1,128.000 to 5,537.000°C	297 [float] read only
Guaranteed Soak Enable	Off (62) On (63)	299 [unsigned] rw
Guaranteed Soak Deviation	-1,999 to 9,999	300 [float] rw
Profile Start Type	Set Point (85) Process (75)	302 [unsigned] rw
Step Time Remaining	0 to 9,999 seconds	303 [float] read only
Jump Count Remaining	0 to 9,999	305 [unsigned] read only
Profile Action Request	None (61) Start Profile (77) Pause Profile (146) Resume Profile (147) Terminate Profile (148) Start Step (89)	306 [unsigned] write only

8 Chapter 8: Factory Page

To go to the Factory Page from the Home Page, press and hold both the Advance ◉ and Infinity ⚭ keys for six seconds.

- Press the Advance Key ◉ to move through the parameter prompts.
- Press the Up ▲ or Down ▼ keys to change the parameter value.
- Press the Infinity Key ⚭ to return to the Home Page.

Navigating the Factory Page



NOTE: Some of these menus and parameters may not appear, depending on the controller's options. See model number information in the Appendix for more information.

Display	Parameter Name Description	Set-tings	Range (Integer values for Modbus in parentheses.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
CUSt FCty **Custom Menu**						
1 [1] to 20 [20]	*Custom Menu* **Parameter 1 to 20** Select the parameters that will appear in the Home Page. The Parameter 1 value will appear in the upper display of the Home Page. The Parameter 2 value will appear in the lower display in the Home Page. If Parameter 3 is set to the default, Action Prompt, it will only appear if there is an error message.		nonE None Pro Process StPt Set Point ACPu Active Process Value ACSP Active Set Point oP Open Loop Set Point ACtn Action Prompt ,CA Calibration Offset C_F Display Units A1Lo Alarm Low Set Point A1hi Alarm High Set Point A1hy Alarm Hysteresis AUt Autotune C1M1 User Control Mode h1Pr Heat Power C1Pr Cool Power ti Time Integral td Time Derivative db Dead Band h1Pb Heat Proportional Band h1hy Heat Hysteresis C1Pb Cool Proportional Band C1hy Cool Hysteresis rrt Ramp Rate CUr Current Read tEUn TRU-TUNE+™ Enable idLE Idle Set Point CUSt Custom Menu P1Str Profile Start P1ACr Profile Action LLS Limit Low Set Point LhS Limit High Set Point Lhy Limit Hysteresis	Active Process Value (1, Top Display) Active Set Point (2, Bottom Display) Action Prompt (3) User Control Mode (4) Heat Power (5) Cool Power (6) Autotune (7) Idle Set Point (8) Profile Start (9) Profile Action (10) None (11 to 20)		always
iid [iid]	*Custom Menu* **Instance** Select the parameters that will appear in the Home Page.		1 to 4			more than one instance.
LoC FCty **Lockout Menu**						
LoC.o [LoC.o]	*Lockout Menu* **Lock Operations Page** Select the security level of the Operations Page. This affects whether parameters can be accessed using the RUI.		1 to 3	2		always
LoC.P [LoC.P]	*Lockout Menu* **Lock Profiling Page** Select the security level of the Profiling Page. This affects whether parameters can be accessed using the RUI.		1 to 3	3		always
Note: Some values will be rounded off to fit in the four-character display. Full values can be read with Modbus. **All temperature parameters through Modbus are in °F.** *** Low register numbers contain the two lower bytes; high register numbers contain the two higher bytes of the four-byte floating-point value.**						

Display	Parameter Name Description	Set-tings	Range (Integer values for Modbus in parentheses.)	Default	Modbus* (less 40,001 offset) read/write	Appears If
dIAG FCty **Diagnostics Menu**						
S.id [S.id]	*Diagnostics Menu* **Software ID** Display the firmware ID number.		0 to 65,636		2 [unsigned] read only	always
S.rL [S.rL]	*Diagnostics Menu* **Software Release** Display the firmware revision.		0 to 65,636		4 [unsigned] read only	always
S.Pr [S.Pr]	*Diagnostics Menu* **Software Prototype** Display the firmware prototype version.		0 to 65,636		6 [unsigned] read only	always
S.bLd [S.bLd]	*Diagnostics Menu* **Software Build** Display the firmware build number.		0 to 65,636		8 [unsigned] read only	always
Sn [Sn]	*Diagnostics Menu* **Serial Number** Display the serial number.		0 to 65,636		12 [unsigned] rw	always
dAtE [dAtE]	*Diagnostics Menu* **Date of Manufacture** Display the date code.		0 to 65,636		14 [unsigned] rw	always
USr.r [USr.r]	*Diagnostics Menu* **User Restore Set** Replace all of the controller's settings with another set.		nonE Don't Load (61) SEt 1 User Set 1 (101) SEt2 User Set 2 (102) FCty Factory Default (31)	Don't Load	16 [unsigned] rw	always
USr.S [USr.S]	*Diagnostics Menu* **User Save Set** Save all of the controller's settings to the selected set.		nonE Don't Save (61) SEt 1 User Set 1 (101) SEt2 User Set 2 (102)	Don't Load	17 [unsigned] rw	always
	Diagnostics Menu **Hardware ID** Display the hardware ID.		0 to 2,147,483,647		0 [unsigned] read only	Modbus only
	Diagnostics Menu **Status Light**		OK (138) Fail (32)		18 [unsigned] read only	Modbus only
CAL FCty **Calibration Menu**	1 CAL **Calibration 1**		1 CAL **Calibration 2** (Analog input 2 appears it ST_L-_ _ _ _-_ _ _ _)			
Pnu [Mv]	*Calibration Menu* **Electrical Measurement** Read the raw electrical value for this input in the units corresponding to the Sensor Type (Setup Page, Analog Input Menu) setting.		-1,999.000 to 9,999.000		309 [1 float] 311 [2 float] read only	always
EL.o [ELi.o]	*Calibration Menu* **Electrical Offset** Change this value to calibrate the low end of the input range.		-2,147,483,647 [-3.4E+38] to 2,147,483,647 [3.4E+38]	0.0	47 [1 float] 75 [2 float] rw	always
EL.S [ELi.S]	*Calibration Menu* **Electrical Slope** Adjust this value to calibrate the slope of the input value.		-2,147,483,647 [-3.4E+38] to 2,147,483,647 [3.4E+38]	1.0	49 [1 float] 77 [2 float] rw	always

Note: Some values will be rounded off to fit in the four-character display. Full values can be read with Modbus.
All temperature parameters through Modbus are in °F.

*** Low register numbers contain the two lower bytes; high register numbers contain the two higher bytes of the four-byte floating-point value.**

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Saving and Restoring User Settings

Recording setup and operations parameter settings for future reference is very important. If you unintentionally change these, you will need to program the correct settings back into the controller to return the equipment to operational condition.

After you program the controller and verify proper operation, use User Save Set [USr.S] (Factory Page, Diagnostics Menu) to save the settings into either of two files in a special section of memory. If the settings in the controller are altered and you want to return the controller to the saved values, use User Restore Set [USr.r] (Factory Page, Diagnostics Menu) to recall one of the saved settings.

Note: Only perform the above procedure when you are sure that all the correct settings are programmed into the controller. Saving the settings overwrites any previously saved collection of settings. Be sure to document all the controller settings.

Programming the Home Page

Watlow's patented user-defined menu system improves operational efficiency. The user-defined Home Page provides you with a shortcut to monitor or change the parameter values that you use most often.

You can create your own Home Page with as many as 20 of the active parameters. When a parameter normally located in the Setup Page or Operations Page is placed in the Home Page, it is accessible through both. If you change a parameter in the Home Page, it is automatically changed in its original page. If you change a parameter in its original page it is automatically changed in the Home Page.

The default parameters will automatically appear in the Home Page. P1 will display the Active Process Value in the upper display, and P2 will display the Active Setpoint in the lower display. Press the arrow keys to change the set point. Press the Advance Key ⊙ to display the P3 value in the upper display and the P3 prompt in the lower display. Press the Advance again to display P4, and so on.

Change the list of parameters in the Home Page from the Custom Menu [CUSt] (Factory Page).

Tuning the PID Parameters

Autotuning

Autotuning without TRU-TUNE+ enabled calculates the optimum heating and/or cooling PID parameter settings based on the system's response to crossing a set point five times. By default the sixth parameter of the Home Page [AUt 1] allows the user to start and stop autotuning using the defined Autotune Set Point [A.tSP] (Operations Page, Loop Menu) value (default: 90% of closed-loop set point). The Autotune Set Point can be changed if the default value does not suit the application.

Note: Autotuning is not recommended while a profile is running or ramping is enabled.

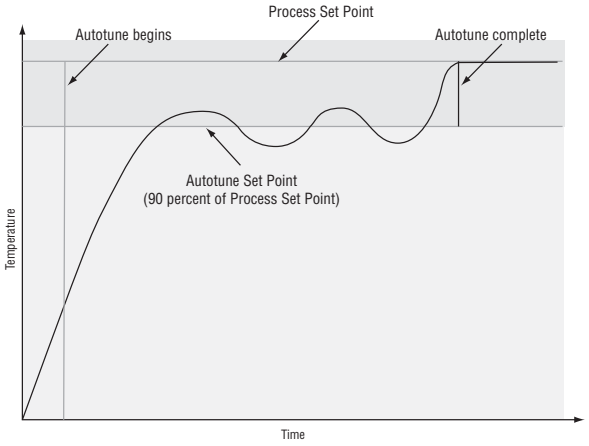
While tuning is underway, the upper display will flash between the process variable and [tUnE], while the lower display will flash between [AtAn] and the set point. This tuning mode must not be interrupted, and it can take up to 60 minutes to complete. If not complete in 60 minutes the autotuning will timeout and the PID coefficients in effect prior to starting the autotune will be reapplied and used. When the tuning process is complete, whether successful or not, the lower display will show the operational set point, and the controller will control to that set point either using the newly calculated (successful tune) PID coefficients or the original values.

The PID parameter values generated by the autotune will continue to be used until one of the following conditions occurs:

- The autotune process is repeated.
- PID values are manually adjusted.
- TRU-TUNE+ is enabled.

If the tuning is interrupted or the 60 minute time period is exceeded, the PID coefficients will not be set to correct autotuned values and the original PID values will be restored. The autotune process will need to be restarted or the control will need to be tuned manually.

1. Apply power to the controller and check that the set point is appropriate for autotuning. If it isn't, set an Autotune Set Point.
2. Begin the autune from the Home Page or the Loop Menu (Operations Page).
3. Allow the autotuning to process to continue until [tUnE] stops flashing in the upper display.



Manual Tuning

In some applications, the autotune process may not provide PID parameters for the process characteristics you desire. If that is the case, you may want to tune the controller manually.

1. Apply power to the controller and establish a set point typically used in your process.
2. Go to the Operations Page, Loop Menu, and set Heat Proportional Band [h.Pb] and/or Cool Proportional Band [C.Pb] to 5. Set Time Integral [t i] to 0. Set Time Derivative [td] to 0.

3. When the system stabilizes, watch the process value. If it fluctuates, increase the Heat Proportional Band or Cool Proportional Band value in 3 to 5° increments until it stabilizes, allowing time for the system to settle between adjustments.
4. When the process has stabilized, watch Heat Power [h.Pr] or Cool Power [C.Pr] (Operations Page, Monitor Menu). It should be stable ±2%. At this point, the process temperature should also be stable, but it will have stabilized before reaching the set point. The difference between the set point and actual process value can be eliminated with Integral.
5. Start with an Integral value of 6,000 and allow 10 minutes for the process temperature to reach the set point. If it has not, reduce the setting by half and wait another 10 minutes. Continue reducing the setting by half every 10 minutes until the process value equals the set point. If the process becomes unstable, the Integral value is too small. Increase the value until the process stabilizes.
6. Increase Derivative to 0.1. Then increase the set point by 11° to 17°C. Monitor the system's approach to the set point. If the process value overshoots the set point, increase Derivative to 0.2. Increase the set point by 11° to 17°C and watch the approach to the new set point. If you increase Derivative too much, the approach to the set point will be very sluggish. Repeat as necessary until the system rises to the new set point without overshoot or sluggishness.

For additional information about autotune and PID control, see related features in this chapter.

General Use of TRU-TUNE+™

TRU-TUNE+, when enabled, can help achieve better process stabilization (process variable equals set point) by dynamically tuning the PID coefficients based on current thermal process responses. In the normal use of TRU-TUNE+ it is recommended that the user execute the following sequence of steps:

1. Autotune the system at the desired operational set point.
2. When complete, activate TRU-TUNE+.
3. Monitor the process until satisfactory control performance is attained.

For applications with known disturbances where additional adaptive tuning is not desired:

4. Deactivate TRU-TUNE+.
5. Return to Step 2 if control performance subsequently deteriorates due to an alteration in the process, such as: 1) a change in load, 2) a change in set point, or 3) a change in process dynamics.

Use of TRU-TUNE+ to Fine Tune PID Coefficients

The two-step process above (step 1 & 2) is the quickest method for fine-tuning a controller to the process. The first step (autotuning) establishes initial control settings based on the system's response to crossing a set point five times. Sometimes the traditional auto tune does not result in control performance that meets expectations or is terminated due to slow process responses. If one or both of these conditions exist, as an alternative to the standard autotune, TRU-TUNE+ can be enabled while placing the control in automatic mode. When TRU-TUNE+ is activated, PID coefficients will be further adjusted as the process runs under automatic control. Once the system is stabilized, where the process variable remains within a specified deviation from set point, TRU-TUNE+ can be deactivated, but it is not necessary to do so.

General Application Guidelines

As stated above TRU-TUNE+ adjusts controller parameters to adapt to changing conditions. Bear in mind if system operation is expected to be interrupted by known abnormal process variations, and during this period there is no desire for the PID terms to be modified, TRU-TUNE+ should be deactivated. Otherwise, the TRU-TUNE+ algorithm will continue to modify PID parameters seeking performance gains when in fact no further changes are needed or desired.

Examples include:

Batch Processing: During production operations TRU-TUNE+ should be deactivated when product is being loaded or unloaded, since processing is not occurring. Once the known interruption has ended re-engage TRU-TUNE+.

Manual Interruption of Load Power but not Controller Power: When the controller is powered but the load is without power (For instance, when a fuse is being replaced.), it is an inappropriate time to adjust PID coefficients since there is an open control loop condition. TRU-TUNE+ should be disengaged and then re-engaged once power is restored to the load.

TRU-TUNE+ Settings

Two parameters are provided for adjusting TRU-TUNE+ behavior, TRU-TUNE+ Band [t.bnd] and TRU-TUNE+ Gain [t.gn], (Setup Page, Loop Menu). Their default values are designed to be suitable for the vast majority of industrial applications. For the few cases where an adjustment is necessary, keep in mind the following:

TRU-TUNE+ Band is automatically selected by TRU-TUNE+ when its value is equal to zero. This default value is appropriate for the vast majority of process control systems. The only time it is advisable to modify it is if TRU-TUNE+ is currently activated, but the process variable continuously deviates from the set point at a relatively large amplitude and does not attenuate. In this case, adjust the Band so it exceeds the maximum deviation from the set point.

TRU-TUNE+ Gain the default setting of 3 is chosen to provide optimum response to set point and load changes for a wide range of industrial processes. It should only be adjusted if the above operational guidelines have been strictly adhered to. In that case, a gain may help if control performance is observed

to be too slow or too fast. To increase the speed of response, increase the gain. To decrease response speed, decrease the gain. A time period of up to the Time Integral [t i] (Operations Page, Loop Menu) value multiplied by 10 seconds is required before an effect can be observed.

Filter Time [F iL] (Setup Page, Analog Input Menu)

When TRU-TUNE+ is enabled, the Filter Time is automatically set by the adaptive tune process, and adjustment by the user is not permitted.

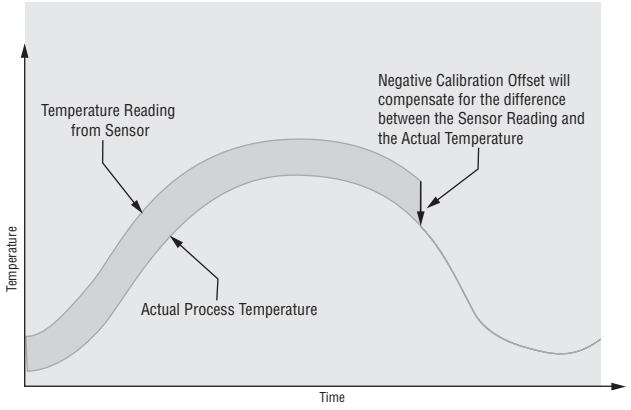
WARNING! During autotuning, the controller sets the output to 100 percent and attempts to drive the process variable toward the set point. Enter a set point and heat and cool power limits that are within the safe operating limits of your system.

Inputs

Calibration Offset

Calibration offset allows a device to compensate for an inaccurate sensor, lead resistance or other factors that affect the input value. A positive offset increases the input value, and a negative offset decreases the input value.

The input offset value can be viewed or changed with Calibration Offset [iCA] (Operations Page, Analog Input Menu).


Temperature Reading from Sensor
Negative Calibration Offset will compensate for the difference between the Sensor Reading and the Actual Temperature
Actual Process Temperature
Temperature
Time

Calibration

To calibrate an analog input, you will need to provide two electrical signals or resistance loads near the extremes of the range that the application is likely to utilize. See recommended values below:

Sensor Type	Low Source	High Source
thermocouple	0.000 mV	50.000 mV
millivolts	0.000 mV	50.000 mV
volts	0.000V	10.000V
milliamps	0.000 mA	20.000 mA
100 Ω RTD	50.00 Ω	350.00 Ω
1,000 Ω RTD	500.00 Ω	3,500.00 Ω

Follow these steps for a thermocouple or process input:

1. Apply the low source signal to the input you are calibrating. Measure the signal to ensure it is accurate.
2. Read the value of Electrical Measurement [rnu] (Factory Page, Calibration Menu) for that input.
3. Calculate the offset value by subtracting this value from the low source signal.
4. Set Electrical Offset [EL io] (Factory Page, Calibration Menu) for this input to the offset value.
5. Check the Electrical Measurement to see whether it now matches the signal. If it doesn't match, adjust Electrical Offset again.
6. Apply the high source signal to the input. Measure the signal to ensure it is accurate.
7. Read the value of Electrical Measurement for that input.
8. Calculate the gain value by dividing the low source signal by this value.
9. Set Electrical Slope [EL iS] (Factory Page, Calibration Menu) for this input to the calculated gain value.
10. Check the Electrical Measurement to see whether it now matches the signal. If it doesn't match, adjust Electrical Slope again.

Set Electrical Offset to 0 and Electrical Slope to 1 to restore factory calibration.

Follow these steps for an RTD input:

1. Measure the low source resistance to ensure it is accurate. Connect the low source resistance to the input you are calibrating.
2. Read the value of Electrical Measurement [rnu] (Factory Page, Calibration Menu) for that input.
3. Calculate the offset value by subtracting this value from the low source resistance.
4. Set Electrical Offset [EL io] (Factory Page, Calibration Menu) for this input to the offset value.
5. Check the Electrical Measurement to see whether it now matches the resistance. If it doesn't match, adjust Electrical Offset again.
6. Measure the high source resistance to ensure it is accurate. Connect the high source resistance to the input.
7. Read the value of Electrical Measurement for that input.
8. Calculate the gain value by dividing the low source signal by this value.
9. Set Electrical Slope [EL iS] (Factory Page, Calibration Menu) for this input to the calculated gain value.
10. Check the Electrical Measurement to see whether it now matches the signal. If it doesn't match, adjust Electrical Slope again.

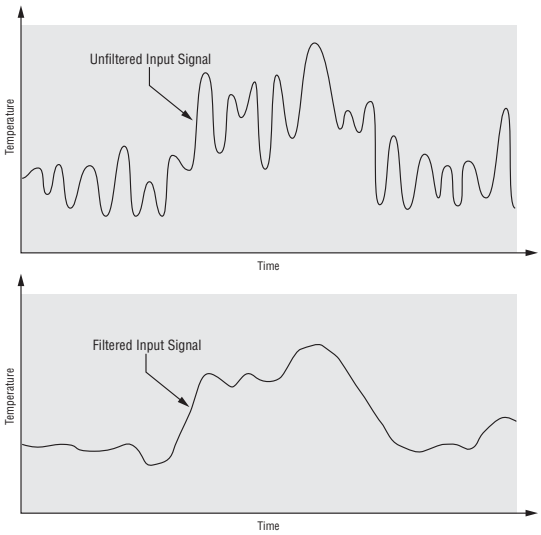
Set Electrical Offset to 0 and Electrical Slope to 1 to restore factory calibration.

Filter Time Constant

Filtering smoothes an input signal by applying a first-order filter time constant to the signal. Filtering the displayed value makes it easier to monitor. Filtering the signal may improve the performance of PID control in a noisy or very dynamic system.

Adjust the filter time interval with Filter Time F iL (Setup Page, Analog Input Menu).

Example: With a filter value of 0.5 seconds, if the process input value instantly changes from 0 to 100 and remained at 100, the display will indicate 100 after five time constants of the filter value or 2.5 seconds.



Sensor Selection

You need to configure the controller to match the input device, which is normally a thermocouple, RTD or process transmitter.

Select the sensor type with Sensor Type SEn (Setup Page, Analog Input Menu).

Sensor Backup

Sensor backup maintains closed-loop control after an input failure by switching control to input 2.

Ensure that the limit sensor can represent the likely range of process values.

Turn sensor backup on or off with Sensor Backup Enable S.bA (Setup Page, Analog Input 1).

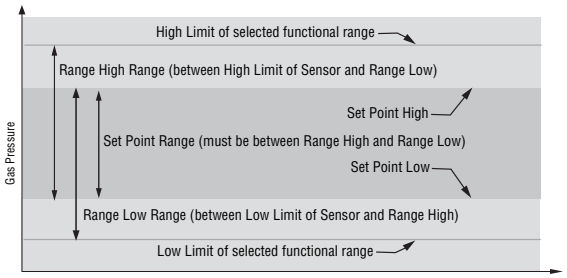
Low Set Point and High Set Point

The controller constrains the set point to a value between a set point low limit and a set point high limit.

Set the closed-loop set point limits with Closed Loop Low Set Point L.SP and Closed Loop High Set Point h.SP (Setup Page, Loop Menu).

Set the open-loop set point limits with Open Loop Low Set Point SP.Lo and Open Loop High Set Point SP.h i (Setup Page, Loop Menu).

There are two sets of set point low and high limits: one for a closed-loop set point, another for an open-loop set point.


High Limit of selected functional range
Range High Range (between High Limit of Sensor and Range Low)
Set Point High
Set Point Range (must be between Range High and Range Low)
Set Point Low
Range Low Range (between Low Limit of Sensor and Range High)
Low Limit of selected functional range
Gas Pressure

Scale High and Scale Low

When an analog input is selected as process voltage or process current input, you must choose the value of voltage or current to be the low and high ends. For example, when using a 4 to 20 mA input, the scale low value would be 4.00 mA and the scale high value would be 20.00 mA. Commonly used scale ranges are: 0 to 20 mA, 4 to 20 mA, 0 to 5V, 1 to 5V and 0 to 10V.

You can create a scale range representing other units for special applications. You can reverse scales from high values to low values for analog input signals that have a reversed action. For example, if 50 psi causes a 4 mA signal and 10 psi causes a 20 mA signal.

Scale low and high low values do not have to match the bounds of the measurement range. These along with range low and high provide for process scaling and can include values not measureable by the controller. Regardless of scaling values, the measured value will be constrained by the electrical measurements of the hardware.

Select the low and high values with Scale Low S.Lo and Scale High S.h i. Select the displayed range with Range Low r.Lo and Range High r.h i (Setup Page, Analog Input Menu).

Range High and Range Low

With a process input, you must choose a value to represent the low and high ends of the current or voltage range. Choosing these values allows the controller's display to be scaled into the actual working units of measurement. For example, the analog input from a humidity transmitter could represent 0 to 100 percent relative humidity as a process signal of 4 to 20 mA. Range Low would be set to 0 to represent 4 mA and Range High set to 100 to represent 20 mA. The indication on the display would then represent percent humidity and range from 0 to 100 percent with an input of 4 to 20 mA.

Select the low and high values with Range Low r.Lo and Range High r.h i (Setup Page, Analog Input Menu).

Control Methods

Output Configuration

Outputs 1, 2 and 3 can be configured as a heat output, a cool output, an alarm output or deactivated. No dependency limitations have been placed on the available combinations. The outputs can be configured in

any combination. For instance, all three could be set to cool.

Heat and cool outputs use the set point and Operations parameters to determine the output value. All heat and cool outputs use the same set point value. Heat and cool each have their own set of control parameters. All heat outputs use the same set of heat control parameters and all cool outputs use the same set of cool output parameters.

Each alarm output has its own set of configuration parameters and set points, allowing independent operation.

Output 4 can only be used as a limit output.

Auto (closed loop) and Manual (open loop) Control

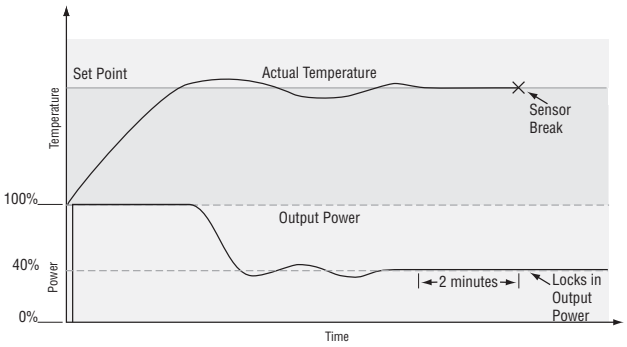
The controller has two basic modes of operation, auto mode and manual mode. Auto mode allows the controller to decide whether to perform closed-loop control or to follow the settings of Input Error Failure FA iL (Setup Page, Loop Menu). The manual mode only allows open-loop control. The EZ-ZONE™ controller is normally used in the auto mode. The manual mode is usually only used for specialty applications or for troubleshooting.

Manual mode is open-loop control that allows the user to directly set the power level to the controller's output load. No adjustments of the output power level occur based on temperature or closed-loop set point in this mode.

In auto mode, the controller monitors the input to determine if closed-loop control is possible. The controller checks to make certain a functioning sensor is providing a valid input signal. If a valid input signal is present, the controller will perform closed-loop control. Closed-loop control uses a process sensor to determine the difference between the process value and the closed-loop set point. Then the controller applies power to a control output load to reduce that difference.

If a valid input signal is not present, the controller will indicate an input error message in the upper display and AtEn in the lower display and respond to the failure according to the setting of Input Error Failure FA iL. You can configure the controller to perform a "bumpless" transfer bPLS, switch power to output a preset fixed level MAn, or turn the output power off.

Bumpless transfer will allow the controller to transfer to the manual mode using the last power value calculated in the auto mode if the process had stabilized at a ±5 percent output power level for the time interval of Time Integral (Operations Page, Loop) prior to sensor failure, and that power level is less than 75 percent.



Input Error Latching i.Er (Setup Page, Analog Input Menu) determines the controller's response once a valid input signal returns to the controller. If latching is on, then the controller will continue to indicate an input error until the error is cleared. To clear a latched alarm, press the Advance Key then the Up Key.

If latching is off, the controller will automatically clear the input error and return to reading the temperature. If the controller was in the auto mode when the input error occurred, it will resume closed-loop control. If the controller was in manual mode when the error occurred, the controller will remain in open-loop control.

The Manual Control Indicator Light % is on when the controller is operating in manual mode.

You can easily switch between modes if the Control Mode C.M parameter is selected to appear in the Home Page.

To transfer to manual mode from auto mode, press the Advance Key until C.M appears in the lower display. The upper display will display Auto for auto mode. Use the Up or Down keys to select MAn. The manual set point value will be recalled from the last manual operation.

To transfer to auto mode from manual mode, press the Advance Key until C.M appears in the lower display. The upper display will display MAn for manual mode. Use the Up or Down keys to select Auto. The automatic set point value will be recalled from the last automatic operation.

Changes take effect after three seconds or immediately upon pressing either the Advance Key or the Infinity Key.

On-Off Control

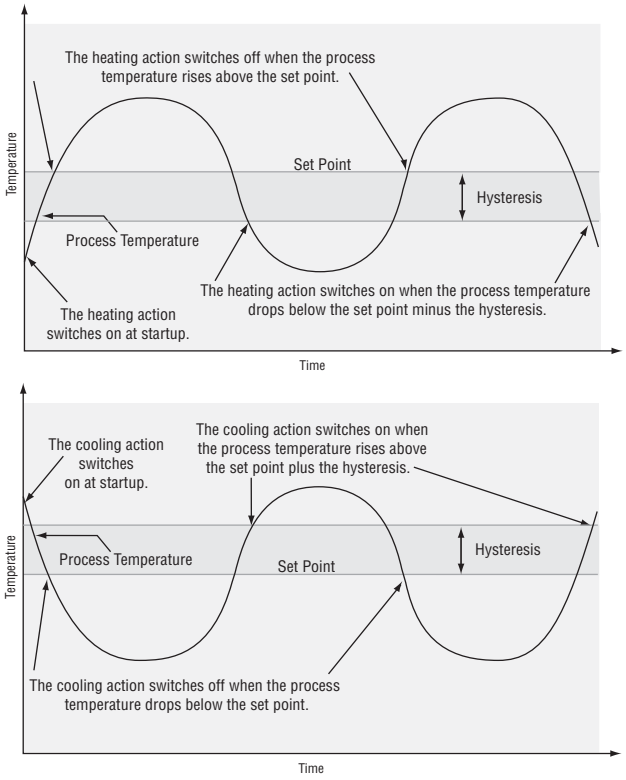
On-off control switches the output either full on or full off, depending on the input, set point and hysteresis values. The hysteresis value indicates the amount the process value must deviate from the set point to turn on the output. Increasing the value decreases the number of times the output will cycle. Decreasing hysteresis improves controllability. With hysteresis set to 0.001, the process value would stay closer to the set point, but the output would switch on and off more frequently, and may result in the output "chattering."

On-off control can be selected with Heat Algorithm

h.Ag or Cool Algorithm C.Ag (Setup Page, Loop Menu).

On-off hysteresis can be set with Heat Hysteresis h.hy or Cool Hysteresis C.hy (Operations Page, Loop Menu).

Note: Input Error Failure Mode FAIL does not function in on-off control mode. The output goes off.


The heating action switches off when the process temperature rises above the set point.
Temperature
Set Point
Hysteresis
Process Temperature
The heating action switches on when the process temperature drops below the set point minus the hysteresis.
The heating action switches on at startup.
Time
The cooling action switches on at startup.
The cooling action switches on when the process temperature rises above the set point plus the hysteresis.
Temperature
Process Temperature
Set Point
Hysteresis
The cooling action switches off when the process temperature drops below the set point.
Time

Proportional Control

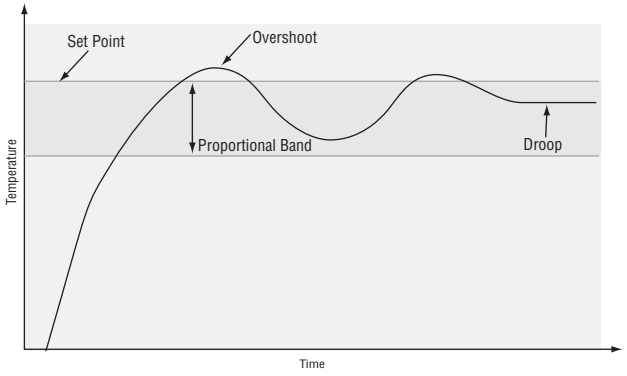
Some processes need to maintain a temperature or process value closer to the set point than on-off control can provide. Proportional control provides closer control by adjusting the output when the temperature or process value is within a proportional band. When the value is in the band, the controller adjusts the output based on how close the process value is to the set point.

The closer the process value is to the set point, the lower the output power. This is similar to backing off on the gas pedal of a car as you approach a stop sign. It keeps the temperature or process value from swinging as widely as it would with simple on-off control. However, when the system settles down, the temperature or process value tends to "droop" short of the set point.

With proportional control the output power level equals (set point minus process value) divided by the proportional band value.

In an application with one output assigned to heating and another assigned to cooling, each will have a separate proportional parameter. The heating parameter takes effect when the process temperature is lower than the set point, and the cooling parameter takes effect when the process temperature is higher than the set point.

Adjust the proportional band with Heat Proportional Band h.Pb or Cool Proportional Band C.Pb (Operations Page, Loop Menu).



Proportional plus Integral (PI) Control

The droop caused by proportional control can be corrected by adding integral (reset) control. When the system settles down, the integral value is tuned to bring the temperature or process value closer to the set point. Integral determines the speed of the correction, but this may increase the overshoot at startup or when the set point is changed. Too much integral action will make the system unstable. Integral is cleared when the process value is outside of the proportional band.

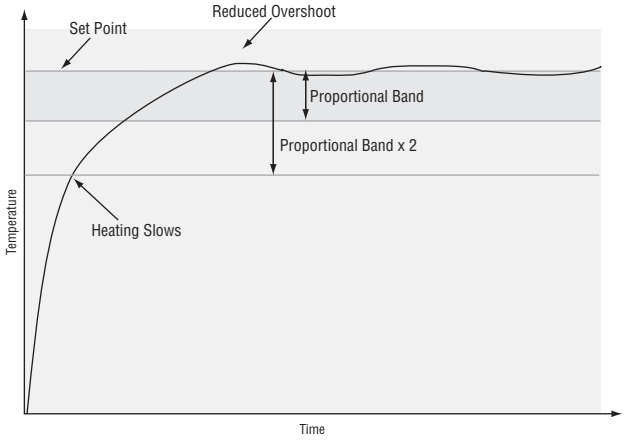
Adjust the integral with Time Integral t.i (Operations Page, Loop Menu).

Proportional plus Integral plus Derivative (PID) Control

Use derivative (rate) control to minimize the overshoot in a PI-controlled system. Derivative (rate) adjusts the output based on the rate of change in the temperature or process value. Too much derivative (rate) will make the system sluggish.

Derivative action is active only when the process value is within twice the proportional value from the set point.

Adjust the derivative with Time Derivative t.d (Operations Page, Loop Menu).

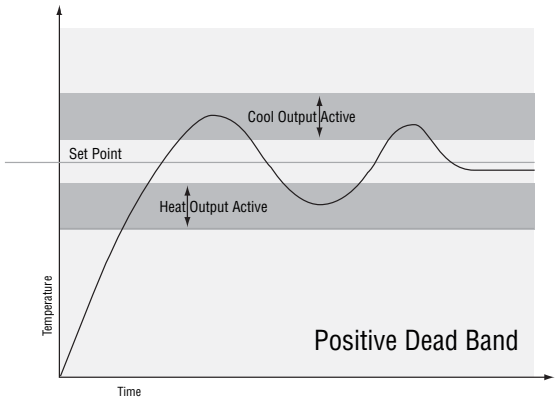


Dead Band

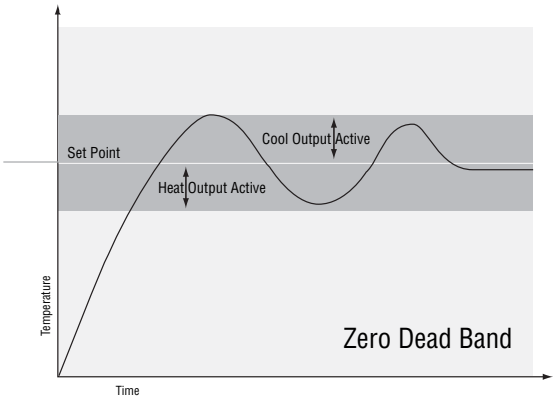
In a PID application the dead bands above and below the set point can save an application's energy and wear by maintaining process temperature within acceptable ranges.

Proportional action ceases when the process value is within the dead band. Integral action continues to bring the process temperature to the set point.

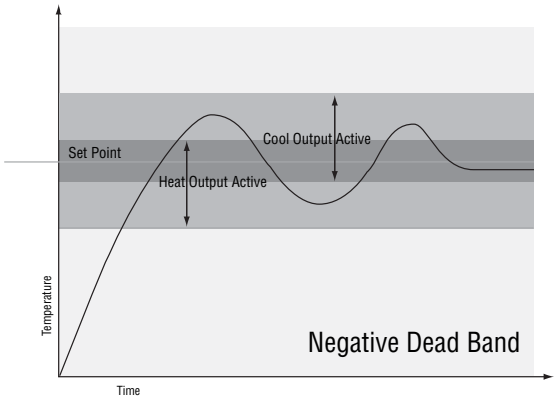
Using a **positive dead band value** keeps the two systems from fighting each other.



When the **dead band value is zero**, the heating output activates when the temperature drops below the set point, and the cooling output switches on when the temperature exceeds the set point.



When the **dead band value is a negative value,** both heating and cooling outputs are active when the temperature is near the set point.



Adjust the dead band with Dead Band db (Operations Page, Loop Menu).

Variable Time Base

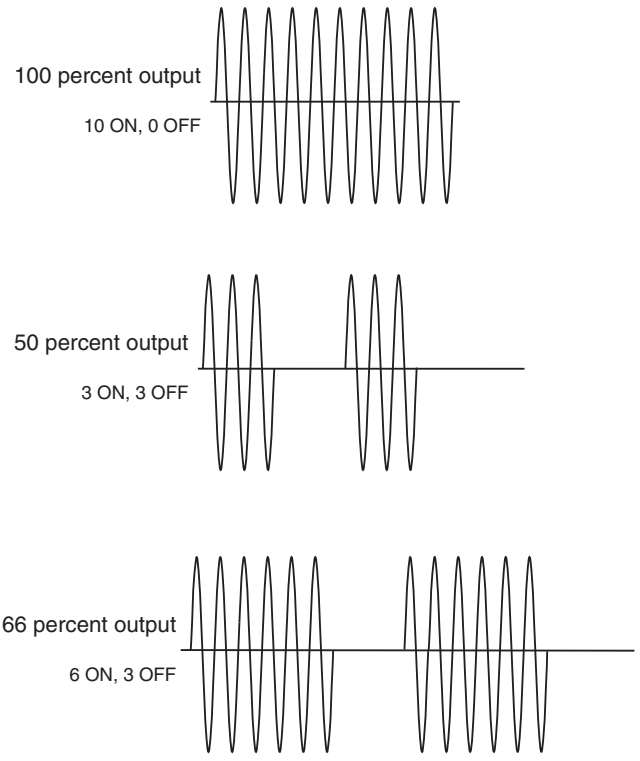
Variable time base is the preferred method for controlling a resistive load, providing a very short time base for longer heater life. Unlike phase-angle firing, variable-time-base switching does not limit the current and voltage applied to the heater.

With variable time base outputs, the PID algorithm calculates an output between 0 and 100%, but the output is distributed in groupings of three ac line cycles. For each group of three ac line cycles, the controller decides whether the power should be on or off. There is no fixed cycle time since the decision is made for each group of cycles. When used in conjunction with a zero cross (burst fire) device, such as a solid-state power controller, switching is done only at the zero cross of the ac line, which helps reduce electrical noise (RFI).

Variable time base should be used with solid-state power controllers, such as a solid-state relay (SSR) or silicon controlled rectifier (SCR) power controller. Do not use a variable time base output for controlling electromechanical relays, mercury displacement relays, inductive loads or heaters with unusual resistance characteristics.

The combination of variable time base output and a solid-state relay can inexpensively approach the effect of analog, phase-angle fired control.

Select the AC Line Frequency AC.LF (Setup Page, Global Menu), 50 or 60 Hz.



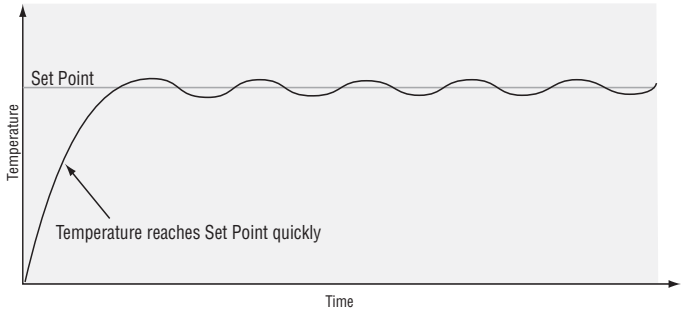
Single Set Point Ramping

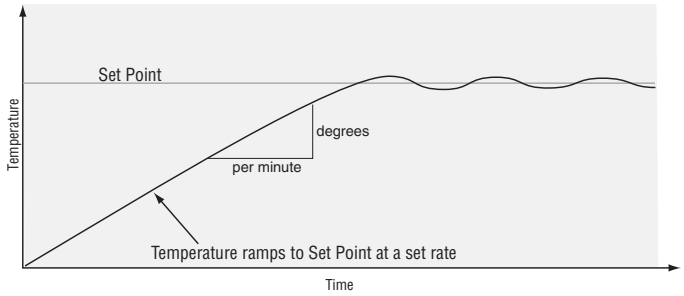
Ramping protects materials and systems that cannot tolerate rapid temperature changes. The value of the ramp rate is the maximum degrees per minute or hour that the system temperature can change.

Select Ramp Action [rP] (Setup Page, Loop Menu):

- [oFF] ramping not active.
- [Str] ramp at startup.
- [StPt] ramp at a set point change.
- [both] ramp at startup or when the set point changes.

Select whether the rate is in degrees per minute or degrees per hour with Ramp Scale [r.SC]. Set the ramping rate with Ramp Rate [r.rt] (Setup Page, Loop Menu).





Alarms

Alarms are activated when the output level, process value or temperature leaves a defined range. A user can configure how and when an alarm is triggered, what action it takes and whether it turns off automatically when the alarm condition is over.

Configure alarms in the Setup Page before setting alarm set points.

Alarms do not have to be assigned to an output. Alarms can be monitored and controlled through the front panel or by using software.

Process and Deviation Alarms

A process alarm uses one or two absolute set points to define an alarm condition.

A deviation alarm uses one or two set points that are defined relative to the control set point. High and low alarm set points are calculated by adding or subtracting offset values from the control set point. If the set point changes, the window defined by the alarm set points automatically moves with it.

Select the alarm type with Type [A.tY] (Setup Page, Alarm Menu).

Alarm Set Points

The alarm high set point defines the process value or temperature that will trigger a high side alarm. It must be higher than the alarm low set point and lower than the high limit of the sensor range.

The alarm low set point defines the temperature that will trigger a low side alarm. It must be lower than the alarm high set point and higher than the low limit of the sensor range.

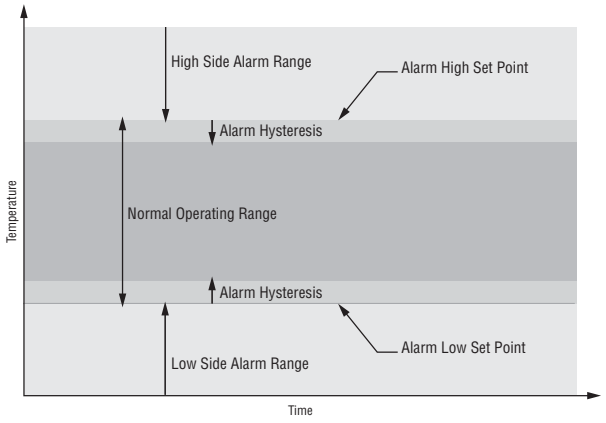
View or change alarm set points with Low Set Point [A.Lo] and High Set Point [A.h1] (Operations Page, Alarm Menu).

Alarm Hysteresis

An alarm state is triggered when the process value reaches the alarm high or alarm low set point. Alarm hysteresis defines how far the process must return into the normal operating range before the alarm can be cleared.

Alarm hysteresis is a zone inside each alarm set point. This zone is defined by adding the hysteresis value to the alarm low set point or subtracting the hysteresis value from the alarm high set point.

View or change alarm hysteresis with Hysteresis [A.hY] (Setup Page, Alarm Menu).



Alarm Latching

A latched alarm will remain active after the alarm condition has passed. It can only be deactivated by the user.

An active message, such as an alarm message, will cause the display to toggle between the normal settings and the active message in the upper display and [AtAn] in the lower display.

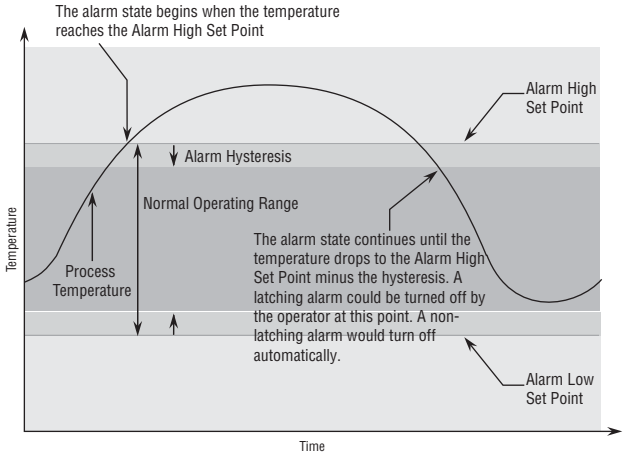
Push the Advance Key to display [1gnr] in the upper display and the message source in the lower display.

Use the Up ▲ and Down ▼ keys to scroll through possible responses, such as Clear [Clr] or Silence [S1L]. Then push the Advance ◉ or Infinity ∞ key to execute the action.

See the Keys and Displays chapter and the Home Page chapter for more details.

An alarm that is not latched (self-clearing) will deactivate automatically when the alarm condition has passed.

Turn alarm latching on or off with Latching [A1LA] (Setup Page, Alarm Menu).


The alarm state begins when the temperature reaches the Alarm High Set Point
Alarm High Set Point
Alarm Hysteresis
Normal Operating Range
Temperature
Process Temperature
The alarm state continues until the temperature drops to the Alarm High Set Point minus the hysteresis. A latching alarm could be turned off by the operator at this point. A non-latching alarm would turn off automatically.
Alarm Low Set Point
Time

Alarm Silencing

If alarm silencing is on the operator can disable the alarm output while the controller is in an alarm state. The process value or temperature has to enter the normal operating range beyond the hysteresis zone to activate the alarm output function again.

An active message, such as an alarm message, will cause the display to toggle between the normal settings and the active message in the upper display and [Atsn] in the lower display.

Push the Advance Key to display [1gnr] in the upper display and the message source in the lower display.

Use the Up ▲ and Down ▼ keys to scroll through possible responses, such as Clear [Clr] or Silence [S1L]. Then push the Advance ◉ or Infinity ∞ key to execute the action.

See the Keys and Displays chapter and the Home Page chapter for more details.

Turn alarm silencing on or off with Silencing [A1S1] (Setup Page, Alarm Menu).

Alarm Blocking

Alarm blocking allows a system to warm up after it has been started up. With alarm blocking on, an alarm is not triggered when the process temperature is initially lower than the alarm low set point or higher than the alarm high set point. The process temperature has to enter the normal operating range beyond the hysteresis zone to activate the alarm function.

If the controller has an output that is functioning as a deviation alarm, the alarm is blocked when the set point is changed, until the process value re-enters the normal operating range.

Turn alarm blocking on or off with Blocking [A1bL] (Setup Page, Alarm Menu).

Current Sensing

Open heater circuit detection

Current Error [C1Er] (Operations Page, Current Menu) detects an open load circuit if no current is flowing through the current transformer when the output is active and the load is supposed to be on.

Shorted heater circuit detection

Current Error detects a shorted load circuit if current is flowing through the current transformer when the output is inactive and the load is supposed to be off.

Set the current detect set points with High Set Point [C1h1] and Low Set Point [C1Lo] (Operations Page, Current Menu).

View the current level and most recent faults with Read, Current Error [C1Er] (Operations Page, Current Menu) and Heater Error [h1Er] (Operations Page, Current Menu).

Programming the EZ Key

You can program the EZ Key either in the Setup Menu or with configuration software, such as EZ-ZONE™ Configurator, using a personal computer.

The following examples show how to program the EZ Key to start and stop a profile.

Using keys and display:

1. To go to the Setup Page from the Home Page, press both the Up ▲ and Down ▼ keys for six seconds. [A1] will appear in the upper display and [SEt] will appear in the lower display.
2. Press the Up Key ▲ until [Fun] appears in the upper display and [SEt] will appear in the lower display.
3. Press the Advance Key ◉ until Digital Input Level [d1L] appears in the lower display. Use an arrow key to specify the state of the key (high or low) when the controller is powered up. Functions will toggle with each press of the EZ Key, such as Profile Start/Stop.
4. Press the Advance Key ◉. The lower display will show Digital Function [dFn]. Press the Up ▲ or Down ▼ key to scroll through the functions that can be assigned to the EZ Key

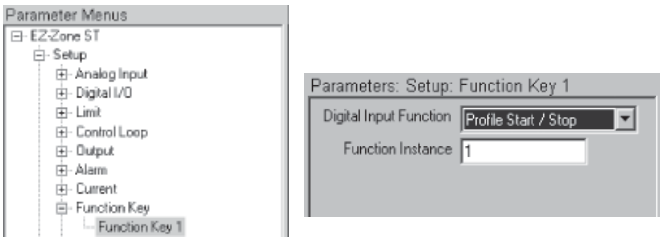
   When Profile Start/Stop [PStS] appears in the upper display and [dFn] appears in the lower display, press the Advance Key ◉ once to select that function and move to the Function Instance [F1S] parameter.

5. Press the Up ▲ or Down ▼ key to scroll to the profile that you want the EZ Key to control.
6. The instance tells the controller which of the numbered functions should be acted upon. For profiles, there are 4 instances. Press the Infinity Key ∞ once to return to the submenu, twice to return to the main menu or three times to return to the Home Page.

Using the software with Standard Bus:

1. Make the necessary physical connections between the personal computer and the controller. Set Protocol (Setup Page, Communications Menu) to Standard Bus. Run the software and allow it to connect to the controller by directing it or allowing it to find the appropriate communications port.
2. After the software connects to the controller, look on the left side of your screen under the Parameters Menus for Function Key under Setup. Click on the plus sign to reveal the Function Key 1 submenu.
3. Click on Function Key 1, then select a Digital Input Function and a Function Instance.

If you want to start and stop a profile with the EZ Key, select Profile Start/Stop and the number of the profile that you want the EZ Key to control.



Using Lockout to Secure Settings

If unintentional changes to parameter settings might raise safety concerns or lead to downtime, your can use the lockout feature to make them more secure.

Each of the menus in the Factory Page and each of the pages, except the Factory Page, has a security level assigned to it. You can change the read and write access to these menus and pages by using the parameters in the Lockout Menu (Factory Page).

Lockout Menu

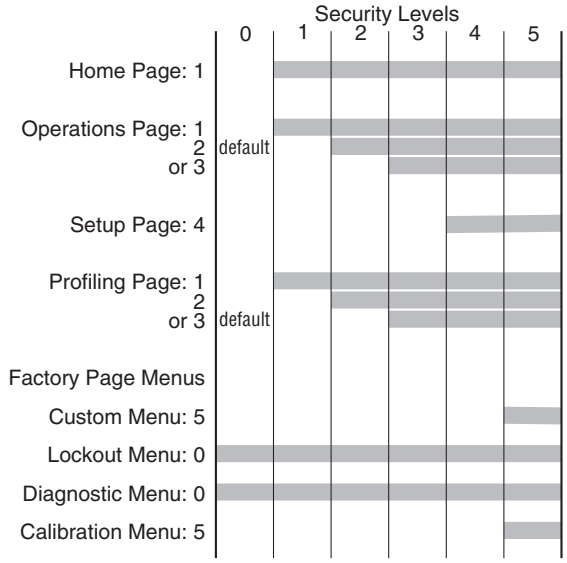
There are four parameters in the Lockout Menu (Factory Page):

Lock Operations Page [LoC.o] sets the security level for the Operations Page. (default: 2)

Lock Profiling Page [LoC.P] sets the security level for the Profiling Page. (default: 3)

Read Lockout Security [rLoC] determines which pages can be accessed. The user can access the selected level and all lower levels. (default: 5)

Set Lockout Security [SLoC] determines which parameters within accessible pages can be written to. The user can write to the selected level and all lower levels. (default: 5)



Bars indicate page and menu access by security level.

The following examples show how the Lockout Menu parameters may be used in applications:

1. You can lock out access to the Operations Page but allow an operator access to the Profile Menu, by changing the default Profile Page and Operations Page security levels. Change Lock Operations Page [LoC.o] to 3 and Lock Profiling Page [LoC.P] to 2. If Set Lockout Security [SLoC] is set to 2 or higher and the Read Lockout Security [rLoC] is set to 2, the Profiling Page and Home Pages can be accessed, and all writable parameters can be written to. Pages with security levels greater than 2 will be locked out (unaccessible).
2 If Set Lockout Security [SLoC] is set to 0 and Read Lockout Security [rLoC] is set to 5, all pages will be accessible, however, changes will not be allowed on any pages or menus, with one exception: Set Lockout Security [SLoC] can be changed to a higher level.
3. The operator wants to read all the menus and not allow any parameters to be changed.

   In the Factory Page, Lockout Menu, set Read Lockout Security [rLoC] to 5 and Set Lockout Security [SLoC] to 0.
4. The operator wants to read and write to the Home Page and Profiling Page, and lock all other pages and menus.

   In the Factory Page, Lockout Menu, set Read Lockout Security [rLoC] to 2 and Set Lockout Security [SLoC] to 2.

   In the Factory Page, Lockout Menu, set Lock Operations Page [LoC.O] to 3 and Lock Profiling Page [LoC.P] to 2.
5. The operator wants to read the Operations Page, Setup Page, Profiling Page, Diagnostics Menu, Lock Menu, Calibration Menu and Custom Menus. The operator also wants to read and write to the Home Page.

In the Factory Page, Lockout Menu, set Read Lockout Security [rLoC] to 1 and Set Lockout Security [SLoC] to 5.

In the Factory Page, Lockout Menu, set Lock Operations Page [LoC.O] to 2 and Lock Profiling Page [LoC.P] to 3.

Profiling

With profiling you can program changes in the process value based on time intervals and events. Set point changes can be ramped. Event outputs can be programmed to turn on or off during the profile. Profiling segments can be looped using Jump Step [JS] and Jump Count [JC] steps (Profiling Page, Step Type).

Profiling can be used to ramp to a specified process value and guarantee that the process value is maintained for a specified period of time.

Forty profiling steps can be divided between as many as four individual profiles that can be run, paused and stopped as needed.

Create and edit profiles with the parameters in the Profiling Page.

Monitor, run, stop and pause profiles with the parameters in the Profile Status Menu (Operations Page).

10 Chapter 10: Appendix

Troubleshooting

Indication	Description	Possible Cause(s)	Corrective Action
Alarm won't clear or reset	Alarm will not clear or reset with keypad or digital input	• Alarm latching is active	• Reset alarm when process is within range or disable latching.
		• Alarm set to incorrect output	• Set output to correct alarm source instance.
		• Alarm is set to incorrect source	• Set alarm source to correct input instance.
		• Sensor input is out of alarm set point range	• Correct cause of sensor input out of alarm range.
		• Alarm set point is incorrect	• Set alarm set point to correct trip point.
		• Alarm is set to incorrect type	• Set alarm to correct type: process, deviation or power.
		• Digital input function is incorrect	• Set digital input function and source instance.
Alarm won't occur	Alarm will not activate output	• Alarm silencing is active	• Disable alarm silencing, if required.
		• Alarm blocking is active	• Disable alarm blocking, if required.
		• Alarm is set to incorrect output	• Set output to correct alarm source instance.
		• Alarm is set to incorrect source	• Set alarm source to correct input instance.
		• Alarm set point is incorrect	• Set alarm set point to correct trip point.
		• Alarm is set to incorrect type	• Set alarm to correct type: process, deviation or power.
AL 1 Alarm Error AL 2	Alarm state cannot be determined due to lack of sensor input	• Sensor improperly wired or open	• Correct wiring or replace sensor.
		• Incorrect setting of sensor type	• Match setting to sensor used.
		• Calibration corrupt	• Check calibration of controller.
	Sensor input below low alarm set point	• Temperature is less than alarm set point	• Check cause of under temperature.
		• Alarm is set to latching and an alarm occurred in the past	• Clear latched alarm.
		• Incorrect alarm set point	• Establish correct alarm set point.
		• Incorrect alarm source	• Set alarm source to proper setting.
	Sensor input above high alarm set point	• Temperature is greater than alarm set point	• Check cause of over temperature.
		• Alarm is set to latching and an alarm occurred in the past	• Clear latched alarm.
		• Incorrect alarm set point	• Establish correct alarm set point.
		• Incorrect alarm source	• Set alarm source to proper setting.
Er.11 Error Input Er.12	Sensor does not provide a valid signal to controller	• Sensor improperly wired or open	• Correct wiring or replace sensor.
		• Incorrect setting of sensor type	• Match setting to sensor used.
		• Calibration corrupt	• Check calibration of controller.
Limit won't clear or reset	Limit will not clear or reset with keypad or digital input	• Sensor input is out of limit set point range	• Correct cause of sensor input out of limit range.
		• Limit set point is incorrect	• Set limit set point to correct trip point.
		• Digital input function is incorrect	• Set digital input function and source instance.
LIM Limit Error	Limit state cannot be determined due to lack of sensor input, limit will trip	• Sensor improperly wired or open	• Correct wiring or replace sensor.
		• Incorrect setting of sensor type	• Match setting to sensor used.
		• Calibration corrupt	• Check calibration of controller.

Indication	Description	Possible Cause(s)	Corrective Action
LiL1 Limit Low LiL2	Sensor input below low limit set point	• Temperature is less than limit set point • Limit outputs latch and require reset • Incorrect alarm set point	• Check cause of under temperature. • Clear limit. • Establish correct limit set point.
LiH1 Limit High LiH2	Sensor input above high limit set point	• Temperature is greater than limit set point • Limit outputs latch and require reset • Incorrect alarm set point	• Check cause of over temperature. • Clear limit. • Establish correct limit set point.
rP Ramping	Controller is ramping to new set point	• Ramping feature is activated	• Disable ramping feature if not required.
tUNE Autotuning	Controller is autotuning the control loop	• User started the autotune function • Digital input is set to start autotune	• Wait until autotune completes or disable autotune feature. • Set digital input to function other than autotune, if desired.
No heat/cool action	Output does not activate load	• Output function is incorrectly set • Control mode is incorrectly set • Output is incorrectly wired • Load, power or fuse is open • Control set point is incorrect • Incorrect controller model for application	• Set output function correctly. • Set control mode appropriately (Open vs Closed Loop). • Correct output wiring. • Correct fault in system. • Set control set point in appropriate control mode and check source of set point: remote, idle, profile, closed loop, open loop. • Obtain correct controller model for application.
No Display	No display indication or LED illumination	• Power to RUI (Remote User Interface) is off • Fuse open • Breaker tripped • Safety interlock switch open • Separate system limit control activated • Wiring error • Incorrect voltage to controller	• Turn on power. • Replace fuse. • Reset breaker. • Close interlock switch. • Reset limit. • Correct wiring issue. • Apply correct voltage, check part number.
No Serial Communication	Cannot establish serial communications with the controller	• Address parameter incorrect • Incorrect protocol selected • Baud rate incorrect • Parity incorrect • Wiring error • EIA-485 converter issue • Incorrect computer or PLC communications port • Incorrect software setup • Termination resistor may be required	• Set unique addresses on network. • Match protocol between devices. • Match baud rate between devices. • Match parity between devices. • Correct wiring issue. • Check settings or replace converter. • Set correct communication port. • Correct software setup to match controller. • Place 120 Ω resistor across EIA-485 on last controller.
Process doesn't control to set point	Process is unstable or never reaches set point	• Controller not tuned correctly • Control mode is incorrectly set • Control set point is incorrect	• Perform autotune or manually tune system. • Set control mode appropriately (Open vs Closed Loop). • Set control set point in appropriate control mode and check source of set point: remote, idle, profile, closed loop, open loop.

Indication	Description	Possible Cause(s)	Corrective Action
Temperature runway	Process value continues to increase or decrease past set point.	• Controller output incorrectly programmed	• Verify output function is correct (heat or cool).
		• Thermocouple reverse wired	• Correct sensor wiring (red wire negative).
		• Controller output wired incorrectly	• Verify and correct wiring.
		• Short in heater	• Replace heater.
		• Power controller connection to controller defective	• Replace or repair power controller.
		• Controller output defective	• Replace or repair controller.
100 Device Error rEtn	Controller displays internal malfunction message at power up.	• Controller defective	• Replace or repair controller.
h.Er Heater Error	Heater Error	• Current through load is above current trip set point	• Check that the load current is proper. Correct cause of overcurrent and/or ensure current trip set point is correct.
		• Current through load is below current trip set point	• Check that the load current is proper. Correct cause of undercurrent and/or ensure current trip set point is correct.
C.Er Current Error	Load current incorrect.	• Shorted solid-state or mechanical relay	• Replace relay.
		• Open solid-state or mechanical relay	• Replace relay.
		• Defective current transformer or controller	• Replace or repair sensor or controller.
		• Noisy electrical lines	• Route wires appropriately, check for loose connections, add line filters.
Menus inaccessible	Unable to access SEt, oPEr, FCty or ProF menus or particular prompts in Home Page	• Security set to incorrect level	• Check lockout setting in Factory Page.
		• Digital input set to lockout keypad	• Change state of digital input.
		• Custom parameters incorrect	• Change custom parameters in Factory Page.
EZ-Key doesn't work	EZ-Key does not activate required function	• EZ-Key function incorrect	• Verify EZ-Key function in Setup Menu.
		• EZ-Key function instance not correct	• Check that the function instance is correct.
		• Keypad malfunction	• Replace or repair controller.
no upper display dEv lower display	The RUI (Remote User Interface) will not communicate with the controller at the selected zone.	• Communications wired incorrectly	• Check and correct wiring.
		• Communications wires routed with power wires	• Check and correct wiring.
		• Zone address set out of range	• Check zone range and address.
		• RUI or controller defective	• Replace or repair RUI or controller.
vALU	Value cannot be displayed	• Scaling is out of range	• Check scaling. • Call technical support.

Modbus Registers For All Parameters

Group	Page - Menu Location	Name in User's Manual	Data Type	Modbus Address (less 40,001 offset)	Access RUI / Modbus
Alarm	Setup - Alarms	Alarm 1 Blocking	unsigned	107	RUI / Modbus
Alarm	Operation - Alarms	Alarm 1 Clear Request	unsigned	108	Modbus only
Alarm	Operation - Alarms	Alarm 1 High Set Point	IEEE Float	97	RUI / Modbus
Alarm	Setup - Alarms	Alarm 1 Hysteresis	IEEE Float	101	RUI / Modbus
Alarm	Setup - Alarms	Alarm 1 Latching	unsigned	106	RUI / Modbus
Alarm	Setup - Alarms	Alarm 1 Logic	unsigned	104	RUI / Modbus
Alarm	Operation - Alarms	Alarm 1 Low Set Point	IEEE Float	99	RUI / Modbus
Alarm	Setup - Alarms	Alarm 1 Sides	unsigned	103	RUI / Modbus
Alarm	Operation - Alarms	Alarm 1 Silence Request	unsigned	109	Modbus only
Alarm	Setup - Alarms	Alarm 1 Silencing	unsigned	105	RUI / Modbus
Alarm	Setup - Alarms	Alarm 1 Source	unsigned	111	RUI / Modbus
Alarm	Setup - Alarms	Alarm 1 Source Instance	unsigned	112	RUI / Modbus
Alarm	Setup - Alarms	Alarm 1 Type	unsigned	110	RUI / Modbus
Alarm	Setup - Alarms	Alarm 2 Blocking	unsigned	123	RUI / Modbus
Alarm	Operation - Alarms	Alarm 2 Clear Request	unsigned	124	Modbus only
Alarm	Operation - Alarms	Alarm 2 High Set Point	IEEE Float	113	RUI / Modbus
Alarm	Setup - Alarms	Alarm 2 Hysteresis	IEEE Float	117	RUI / Modbus
Alarm	Setup - Alarms	Alarm 2 Latching	unsigned	122	RUI / Modbus
Alarm	Setup - Alarms	Alarm 2 Logic	unsigned	120	RUI / Modbus
Alarm	Operation - Alarms	Alarm 2 Low Set Point	IEEE Float	115	RUI / Modbus
Alarm	Setup - Alarms	Alarm 2 Sides	unsigned	119	RUI / Modbus
Alarm	Operation - Alarms	Alarm 2 Silence Request	unsigned	125	Modbus only
Alarm	Setup - Alarms	Alarm 2 Silencing	unsigned	121	RUI / Modbus
Alarm	Setup - Alarms	Alarm 2 Source	unsigned	127	RUI / Modbus
Alarm	Setup Alarms	Alarm 2 Source Instance	unsigned	128	RUI / Modbus
Alarm	Setup - Alarms	Alarm 2 Type	unsigned	126	RUI / Modbus
Analog Input	Factory - Calibration	Input 1 Calibration Electrical Offset	IEEE Float	47	RUI / Modbus
Analog Input	Operation - Analog Input	Input 1 Calibration Offset	IEEE Float	51	RUI / Modbus
Analog Input	Factory - Calibration	Input 1 Electrical Measurement	IEEE Float	309	RUI / Modbus
Analog Input	Factory - Calibration	Input 1 Electrical Slope	IEEE Float	49	RUI / Modbus
Analog Input	Setup - Analog Input	Input 1 Error Latching	unsigned	67	Modbus only
Analog Input	Setup - Analog Input	Input 1 Error Reset	unsigned	68	Modbus only
Analog Input	Operation - Analog Input	Input 1 Error Status	unsigned	41	RUI / Modbus
Analog Input	Setup - Analog Input	Input 1 Filter Time	IEEE Float	55	RUI / Modbus
Analog Input	Setup - Analog Input	Input 1 Linearization	unsigned	43	RUI / Modbus
Analog Input	Setup - Analog Input	Input 1 Range High	IEEE Float	63	RUI / Modbus
Analog Input	Setup - Analog Input	Input 1 Range Low	IEEE Float	61	RUI / Modbus
Analog Input	Setup - Analog Input	Input 1 RTD Leads	unsigned	44	RUI / Modbus
Analog Input	Setup - Analog Input	Input 1 Scale High	IEEE Float	59	RUI / Modbus
Analog Input	Setup - Analog Input	Input 1 Scale Low	IEEE Float	57	RUI / Modbus
Analog Input	Setup - Analog Input	Input 1 Sensor Backup Enable	unsigned	65	RUI / Modbus

Note: Excessive writes to EEPROM over Modbus can cause premature EEPROM failure. The EEPROM is rated for 1,000,000 writes. See "Saving Settings to Nonvolatile Memory" in Chapter 2, Install and Wire.

Group	Page - Menu Location	Name in User's Manual	Data Type	Modbus Address (less 40,001 offset)	Access RUI / Modbus
Analog Input	Setup - Analog Input	Input 1 Sensor Type	unsigned	42	RUI / Modbus
Analog Input	Operation - Analog Input	Input 2 Error Status	unsigned	69	RUI / Modbus
Analog Input	Factory - Calibration	Input 2 Calibration Electrical Offset	IEEE Float	75	RUI / Modbus
Analog Input	Operation Analog Input	Input 2 Calibration Offset	IEEE Float	79	RUI / Modbus
Analog Input	Factory - Calibration	Input 2 Electrical Measurement	IEEE Float	311	RUI / Modbus
Analog Input	Factory - Calibration	Input 2 Electrical Slope	IEEE Float	77	RUI / Modbus
Analog Input	Setup - Analog Input	Input 2 Error Latching	unsigned	95	RUI / Modbus
Analog Input	Setup - Analog Input	Input 2 Error Reset	unsigned	96	Modbus only
Analog Input	Setup - Analog Input	Input 2 Filter Time	IEEE Float	83	RUI / Modbus
Analog Input	Setup - Analog Input	Input 2 Linearization	unsigned	71	RUI / Modbus
Analog Input	Setup - Analog Input	Input 2 Range High	IEEE Float	91	RUI / Modbus
Analog Input	Setup - Analog Input	Input 2 Range Low	IEEE Float	89	RUI / Modbus
Analog Input	Setup - Analog Input	Input 2 RTD Leads	unsigned	72	RUI / Modbus
Analog Input	Setup - Analog Input	Input 2 Scale High	IEEE Float	87	RUI / Modbus
Analog Input	Setup - Analog Input	Input 2 Scale Low	IEEE Float	85	RUI / Modbus
Analog Input	Setup - Analog Input	Input 2 Sensor Type	unsigned	70	RUI / Modbus
Communications	See Chapter 2	Address	unsigned	313	Modbus only
Communications	See Chapter 2	Baud	unsigned	314	Modbus only
Communications	See Chapter 2	Non-Volatile Save	unsigned	317	Modbus only
Communications	See Chapter 2	Parity	unsigned	315	Modbus only
Control Loop	Setup - Loop	Autotune Aggressiveness	unsigned	259	RUI / Modbus
Control Loop	Operation - Loop	Autotune Request	unsigned	262	RUI / Modbus
Control Loop	Operation - Loop	Autotune Set Point	IEEE Float	260	RUI / Modbus
Control Loop	Operation - Loop	Control Mode	unsigned	221	RUI / Modbus
Control Loop	Operation - Monitor	Control Mode Active	unsigned	222	RUI / Modbus
Control Loop	Setup - Loop	Cool Algorithm	unsigned	224	RUI / Modbus
Control Loop	Operation - Loop	Cool Hysteresis	IEEE Float	240	RUI / Modbus
Control Loop	Operation - Monitor	Cool Power	IEEE Float	242	RUI / Modbus
Control Loop	Operation - Loop	Cool Proportional Band	IEEE Float	238	RUI / Modbus
Control Loop	Operation - Loop	Dead Band	IEEE Float	230	RUI / Modbus
Control Loop	Setup - Loop	Heat Algorithm	unsigned	223	RUI / Modbus
Control Loop	Operation - Loop	Heat Hysteresis	IEEE Float	234	RUI / Modbus
Control Loop	Operation - Monitor	Heat Power	IEEE Float	236	RUI / Modbus
Control Loop	Operation - Loop	Heat Proportional Band	IEEE Float	232	RUI / Modbus
Control Loop	Operation - Loop	Loop Action	unsigned	225	RUI / Modbus
Control Loop	Operation - Loop	Time Derivative	IEEE Float	228	RUI / Modbus
Control Loop	Operation - Loop	Time Integral	IEEE Float	226	RUI / Modbus
Control Loop	Setup - Loop	Tru-tune Band	unsigned	307	RUI / Modbus
Control Loop	Setup - Loop	Tru-tune Enable	unsigned	257	RUI / Modbus
Control Loop	Setup - Loop	Tru-tune Gain	unsigned	308	RUI / Modbus
Control Loop	Operation - Monitor	Tune Status	unsigned	263	Modbus only
Current Sense	Setup - Current	Current Detect Threshold	unsigned	285	RUI / Modbus
Current Sense	Operation - Current	Current Heater Error	unsigned	282	RUI / Modbus
Current Sense	Operation - Current	Current High Set Point	IEEE Float	286	RUI / Modbus
Current Sense	Setup - Current	Current Limit Enable	unsigned	284	RUI / Modbus
Current Sense	Operation - Current	Current Low Set Point	IEEE Float	288	RUI / Modbus
Current Sense	Setup - Current	Current Sides	unsigned	283	RUI / Modbus
Device	Factory - Diagnostics	Status Light	unsigned	18	Modbus only
Device	Factory - Diagnostics	Custom	unsigned	10	RUI / Modbus
Device	Factory - Diagnostics	Date of Manufacture	unsigned	14	RUI / Modbus

Group	Page - Menu Location	Name in User's Manual	Data Type	Modbus Address (less 40,001 offset)	Access RUI / Modbus
Device	Factory - Diagnostics	Hardware ID	unsigned	0	Modbus only
Device	Factory - Diagnostics	Serial Number	unsigned	12	RUI / Modbus
Device	Factory - Diagnostics	Software Build	unsigned	8	RUI / Modbus
Device	Factory - Diagnostics	Software ID	unsigned	2	RUI / Modbus
Device	Factory - Diagnostics	Software Prototype Version	unsigned	6	RUI / Modbus
Device	Factory - Diagnostics	Software Release Version	unsigned	4	RUI / Modbus
Device	Factory - Diagnostics	User Restore Set	unsigned	16	RUI / Modbus
Device	Factory - Diagnostics	User Save Set	unsigned	17	RUI / Modbus
Digital I/O	Setup - Global	AC Line Frequency	unsigned	129	RUI / Modbus
Digital I/O	Setup - Digital I/O	Digital I/O 5 Direction	unsigned	169	RUI / Modbus
Digital I/O	Setup - Digital I/O	Digital I/O 6 Direction	unsigned	182	RUI / Modbus
Digital I/O	Setup - Digital I/O	Digital Output 5 Function	unsigned	173	RUI / Modbus
Digital I/O	Setup - Digital I/O	Digital Output 5 Function Instance	unsigned	174	Modbus only
Digital I/O	Operation - Digital I/O	Digital Output 5 State	unsigned	175	RUI / Modbus
Digital I/O	Setup - Digital I/O	Digital Output 6 Function	unsigned	186	RUI / Modbus
Digital I/O	Setup - Digital I/O	Digital Output 6 Function Instance	unsigned	187	Modbus only
Digital I/O	Operation Digital I/O	Digital Output 6 State	unsigned	188	RUI / Modbus
Digital I/O	Setup - Output	Output 1 Control	unsigned	131	RUI / Modbus
Digital I/O	Setup - Output	Output 1 Function	unsigned	134	RUI / Modbus
Digital I/O	Setup - Output	Output 1 Function Instance	unsigned	135	RUI / Modbus
Digital I/O	Setup - Output	Output 1 High Power Scale	IEEE Float	141	RUI / Modbus
Digital I/O	Setup - Output	Output 1 Low Power Scale	IEEE Float	139	RUI / Modbus
Digital I/O	Setup - Output	Output 1 Time Base	IEEE Float	132	RUI / Modbus
Digital I/O	Setup - Output	Output 2 Control	unsigned	144	RUI / Modbus
Digital I/O	Setup - Output	Output 2 Function	unsigned	147	RUI / Modbus
Digital I/O	Setup - Output	Output 2 Function Instance	unsigned	148	RUI / Modbus
Digital I/O	Setup - Output	Output 2 High Power Scale	IEEE Float	154	RUI / Modbus
Digital I/O	Setup - Output	Output 2 Low Power Scale	IEEE Float	152	RUI / Modbus
Digital I/O	Setup - Output	Output 2 Time Base	IEEE Float	145	RUI / Modbus
Digital I/O	Setup - Output	Output 3 Control	unsigned	157	RUI / Modbus
Digital I/O	Setup - Output	Output 3 Function	unsigned	160	RUI / Modbus
Digital I/O	Setup - Output	Output 3 Function Instance	unsigned	161	RUI / Modbus
Digital I/O	Setup - Output	Output 3 High Power Scale	IEEE Float	167	RUI / Modbus
Digital I/O	Setup - Output	Output 3 Low Power Scale	IEEE Float	165	RUI / Modbus
Digital I/O	Setup - Output	Output 3 Time Base	IEEE Float	158	RUI / Modbus
Event	Setup - Digital I/O	Digital Input 5 Level	unsigned	264	RUI / Modbus
Event	Setup - Digital I/O	Digital Input 5 Source Instance	unsigned	265	Modbus only
Event	Setup - Digital I/O	Digital Input 6 Level	unsigned	268	RUI / Modbus
Event	Setup - Digital I/O	Digital Input 6 Source Instance	unsigned	269	Modbus only
Event	Setup - Digital I/O	Digtial Input 5 Function	unsigned	266	RUI / Modbus
Event	Setup - Digital I/O	Digtial Input 5 Function Instance	unsigned	267	RUI / Modbus
Event	Setup - Digital I/O	Digtial Input 6 Function	unsigned	270	RUI / Modbus
Event	Setup - Digital I/O	Digtial Input 6 Function Instance	unsigned	271	RUI / Modbus
Limit	Operation - Limit	Limit Clear Request	unsigned	272	Modbus only
Limit	Operation - Limit	Limit High Set Point	IEEE Float	277	RUI / Modbus
Limit	Setup - Limit	Limit Hysteresis	IEEE Float	273	RUI / Modbus
Limit	Setup - Limit	Limit Integrate	unsigned	316	RUI / Modbus
Limit	Operation - Limit	Limit Low Set Point	IEEE Float	275	RUI / Modbus
Limit	Setup - Limit	Limit Sides	unsigned	279	RUI / Modbus
Limit	Operation - Limit	Limit State	unsigned	280	Modbus only

Group	Page - Menu Location	Name in User's Manual	Data Type	Modbus Address (less 40,001 offset)	Access RUI / Modbus
Profile Control	Setup - Global	Guaranteed Soak Enable	unsigned	299	RUI / Modbus
Profile Control	Setup - Global	Guranteed Soak Deviation	IEEE Float	300	RUI / Modbus
Profile Control	Operation - Profile Status	Jump Count Remaining	unsigned	305	RUI / Modbus
Profile Control	Operation - Profile Status	Monitor Current File	unsigned	295	RUI / Modbus
Profile Control	Operation - Profile Status	Active Step	unsigned	296	RUI / Modbus
Profile Control	Operation - Profile Status	Monitor Profile State	unsigned	294	RUI / Modbus
Profile Control	Operation - Profile Status	Step Time Remaining	IEEE Float	303	RUI / Modbus
Profile Control	Operation - Profile Status	Monitor Target Set Point	IEEE Float	297	RUI / Modbus
Profile Control	Operation - Profile Status	Profile Action Request	unsigned	306	RUI / Modbus
Profile Control	Operation - Profile Status	Profile Start Type	unsigned	302	RUI / Modbus
Profile Control	Operation - Profile Status	Profile Start	unsigned	292	RUI / Modbus
Profile Management	Profiling Page	Step 1 - End Type	unsigned	516	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Event Output 1	unsigned	508	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Event Output 2	unsigned	509	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Hours	unsigned	503	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Jump Count	unsigned	515	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Jump Step	unsigned	514	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Minutes	unsigned	504	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Rate	IEEE Float	506	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Seconds	unsigned	505	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Step Type	unsigned	500	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Target Set Point	IEEE Float	501	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Wait Event Event 1	unsigned	510	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Wait Event Event 2	unsigned	511	RUI / Modbus
Profile Management	Profiling Page	Step 1 - Wait For Process	IEEE Float	512	RUI / Modbus
Profile Management	Profiling Page	Step 2 - End Type	unsigned	536	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Event Output 1	unsigned	528	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Event Output 2	unsigned	529	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Hours	unsigned	523	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Jump Count	unsigned	535	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Jump Step	unsigned	534	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Minutes	unsigned	524	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Rate	IEEE Float	526	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Seconds	unsigned	525	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Step Type	unsigned	520	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Target Set Point	IEEE Float	521	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Wait Event Event 1	unsigned	530	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Wait Event Event 2	unsigned	531	RUI / Modbus
Profile Management	Profiling Page	Step 2 - Wait For Process	IEEE Float	532	RUI / Modbus
Profile Management	Profiling Page	Step 3 - End Type	unsigned	556	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Event Output 1	unsigned	548	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Event Output 2	unsigned	549	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Hours	unsigned	543	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Jump Count	unsigned	555	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Jump Step	unsigned	554	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Minutes	unsigned	544	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Rate	IEEE Float	546	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Seconds	unsigned	545	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Step Type	unsigned	540	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Target Set Point	IEEE Float	541	RUI / Modbus

Group	Page - Menu Location	Name in User's Manual	Data Type	Modbus Address (less 40,001 offset)	Access RUI / Modbus
Profile Management	Profiling Page	Step 3 - Wait Event Event 1	unsigned	550	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Wait Event Event 2	unsigned	551	RUI / Modbus
Profile Management	Profiling Page	Step 3 - Wait For Process	IEEE Float	552	RUI / Modbus
Profile Management	Profiling Page	Step 4 - End Type	unsigned	576	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Event Output 1	unsigned	568	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Event Output 2	unsigned	569	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Hours	unsigned	563	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Jump Count	unsigned	575	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Jump Step	unsigned	574	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Minutes	unsigned	564	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Rate	IEEE Float	566	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Seconds	unsigned	565	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Step Type	unsigned	560	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Target Set Point	IEEE Float	561	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Wait Event Event 1	unsigned	570	RUI / Modbus
Profile Management	Profiling Page	Step 4 - Wait Event Event 2	unsigned	571	RUI / Modbus
Profile Management	Profiling Page	Step 5 - End Type	unsigned	596	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Event Output 1	unsigned	588	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Event Output 2	unsigned	589	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Hours	unsigned	583	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Jump Count	unsigned	595	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Jump Step	unsigned	594	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Minutes	unsigned	584	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Rate	IEEE Float	586	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Seconds	unsigned	585	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Step Type	unsigned	580	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Target Set Point	IEEE Float	581	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Wait Event Event 1	unsigned	590	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Wait Event Event 2	unsigned	591	RUI / Modbus
Profile Management	Profiling Page	Step 5 - Wait For Process	IEEE Float	592	RUI / Modbus
Profile Management	Profiling Page	Step 6 - End Type	unsigned	616	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Event Output 1	unsigned	608	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Event Output 2	unsigned	609	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Hours	unsigned	603	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Jump Count	unsigned	615	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Jump Step	unsigned	614	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Minutes	unsigned	604	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Rate	IEEE Float	606	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Seconds	unsigned	605	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Step Type	unsigned	600	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Target Set Point	IEEE Float	601	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Wait Event Event 1	unsigned	610	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Wait Event Event 2	unsigned	611	RUI / Modbus
Profile Management	Profiling Page	Step 6 - Wait For Process	IEEE Float	612	RUI / Modbus
Profile Management	Profiling Page	Step 7 - End Type	unsigned	636	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Event Output 1	unsigned	628	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Event Output 2	unsigned	629	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Hours	unsigned	623	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Jump Count	unsigned	635	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Jump Step	unsigned	634	RUI / Modbus

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Profile Management	Profiling Page	Step 7 - Minutes	unsigned	624	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Rate	IEEE Float	626	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Seconds	unsigned	625	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Step Type	unsigned	620	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Target Set Point	IEEE Float	621	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Wait Event Event 1	unsigned	630	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Wait Event Event 2	unsigned	631	RUI / Modbus
Profile Management	Profiling Page	Step 7 - Wait For Process	IEEE Float	632	RUI / Modbus
Profile Management	Profiling Page	Step 8 - End Type	unsigned	656	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Event Output 1	unsigned	648	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Event Output 2	unsigned	649	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Hours	unsigned	643	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Jump Count	unsigned	655	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Jump Step	unsigned	654	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Minutes	unsigned	644	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Rate	IEEE Float	646	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Seconds	unsigned	645	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Step Type	unsigned	640	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Target Set Point	IEEE Float	641	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Wait Event Event 1	unsigned	650	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Wait Event Event 2	unsigned	651	RUI / Modbus
Profile Management	Profiling Page	Step 8 - Wait For Process	IEEE Float	652	RUI / Modbus
Profile Management	Profiling Page	Step 9 - End Type	unsigned	676	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Event Output 1	unsigned	668	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Event Output 2	unsigned	669	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Hours	unsigned	663	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Jump Count	unsigned	675	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Jump Step	unsigned	674	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Minutes	unsigned	664	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Rate	IEEE Float	666	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Seconds	unsigned	665	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Step Type	unsigned	660	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Target Set Point	IEEE Float	661	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Wait Event Event 1	unsigned	670	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Wait Event Event 2	unsigned	671	RUI / Modbus
Profile Management	Profiling Page	Step 9 - Wait For Process	IEEE Float	672	RUI / Modbus
Profile Management	Profiling Page	Step 10 - End Type	unsigned	696	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Event Output 1	unsigned	688	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Event Output 2	unsigned	689	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Hours	unsigned	683	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Jump Count	unsigned	695	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Jump Step	unsigned	694	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Minutes	unsigned	684	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Rate	IEEE Float	686	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Seconds	unsigned	685	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Step Type	unsigned	680	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Target Set Point	IEEE Float	681	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Wait Event Event 1	unsigned	690	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Wait Event Event 2	unsigned	691	RUI / Modbus
Profile Management	Profiling Page	Step 10 - Wait For Process	IEEE Float	692	RUI / Modbus

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Profile Management	Profiling Page	Step 11 - End Type	unsigned	716	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Event Output 1	unsigned	708	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Event Output 2	unsigned	709	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Hours	unsigned	703	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Jump Count	unsigned	715	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Jump Step	unsigned	714	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Minutes	unsigned	704	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Rate	IEEE Float	706	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Seconds	unsigned	705	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Step Type	unsigned	700	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Target Set Point	IEEE Float	701	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Wait Event Event 1	unsigned	710	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Wait Event Event 2	unsigned	711	RUI / Modbus
Profile Management	Profiling Page	Step 11 - Wait For Process	IEEE Float	712	RUI / Modbus
Profile Management	Profiling Page	Step 12 - End Type	unsigned	736	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Event Output 1	unsigned	728	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Event Output 2	unsigned	729	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Hours	unsigned	723	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Jump Count	unsigned	735	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Jump Step	unsigned	734	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Minutes	unsigned	724	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Rate	IEEE Float	726	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Seconds	unsigned	725	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Step Type	unsigned	720	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Target Set Point	IEEE Float	721	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Wait Event Event 1	unsigned	730	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Wait Event Event 2	unsigned	731	RUI / Modbus
Profile Management	Profiling Page	Step 12 - Wait For Process	IEEE Float	732	RUI / Modbus
Profile Management	Profiling Page	Step 13 - End Type	unsigned	756	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Event Output 1	unsigned	748	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Event Output 2	unsigned	749	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Hours	unsigned	743	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Jump Count	unsigned	755	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Jump Step	unsigned	754	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Minutes	unsigned	744	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Rate	IEEE Float	746	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Seconds	unsigned	745	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Step Type	unsigned	740	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Target Set Point	IEEE Float	741	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Wait Event Event 1	unsigned	750	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Wait Event Event 2	unsigned	751	RUI / Modbus
Profile Management	Profiling Page	Step 13 - Wait For Process	IEEE Float	752	RUI / Modbus
Profile Management	Profiling Page	Step 14 - End Type	unsigned	776	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Event Output 1	unsigned	768	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Event Output 2	unsigned	769	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Hours	unsigned	763	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Jump Count	unsigned	775	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Jump Step	unsigned	774	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Minutes	unsigned	764	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Rate	IEEE Float	766	RUI / Modbus

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Profile Management	Profiling Page	Step 14 - Seconds	unsigned	765	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Step Type	unsigned	760	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Target Set Point	IEEE Float	761	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Wait Event Event 1	unsigned	770	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Wait Event Event 2	unsigned	771	RUI / Modbus
Profile Management	Profiling Page	Step 14 - Wait For Process	IEEE Float	772	RUI / Modbus
Profile Management	Profiling Page	Step 15 - End Type	unsigned	796	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Event Output 1	unsigned	788	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Event Output 2	unsigned	789	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Hours	unsigned	783	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Jump Count	unsigned	795	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Jump Step	unsigned	794	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Minutes	unsigned	784	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Rate	IEEE Float	786	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Seconds	unsigned	785	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Step Type	unsigned	780	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Target Set Point	IEEE Float	781	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Wait Event Event 1	unsigned	790	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Wait Event Event 2	unsigned	791	RUI / Modbus
Profile Management	Profiling Page	Step 15 - Wait For Process	IEEE Float	792	RUI / Modbus
Profile Management	Profiling Page	Step 16 - End Type	unsigned	816	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Event Output 1	unsigned	808	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Event Output 2	unsigned	809	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Hours	unsigned	803	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Jump Count	unsigned	815	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Jump Step	unsigned	814	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Minutes	unsigned	804	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Rate	IEEE Float	806	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Seconds	unsigned	805	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Step Type	unsigned	800	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Target Set Point	IEEE Float	801	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Wait Event Event 1	unsigned	810	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Wait Event Event 2	unsigned	811	RUI / Modbus
Profile Management	Profiling Page	Step 16 - Wait For Process	IEEE Float	812	RUI / Modbus
Profile Management	Profiling Page	Step 17 - End Type	unsigned	836	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Event Output 1	unsigned	828	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Event Output 2	unsigned	829	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Hours	unsigned	823	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Jump Count	unsigned	835	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Jump Step	unsigned	834	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Minutes	unsigned	824	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Rate	IEEE Float	826	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Seconds	unsigned	825	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Step Type	unsigned	820	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Target Set Point	IEEE Float	821	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Wait Event Event 1	unsigned	830	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Wait Event Event 2	unsigned	831	RUI / Modbus
Profile Management	Profiling Page	Step 17 - Wait For Process	IEEE Float	832	RUI / Modbus
Profile Management	Profiling Page	Step 18 - End Type	unsigned	856	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Event Output 1	unsigned	848	RUI / Modbus

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Profile Management	Profiling Page	Step 18 - Event Output 2	unsigned	849	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Hours	unsigned	843	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Jump Count	unsigned	855	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Jump Step	unsigned	854	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Minutes	unsigned	844	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Rate	IEEE Float	846	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Seconds	unsigned	845	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Step Type	unsigned	840	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Target Set Point	IEEE Float	841	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Wait Event Event 1	unsigned	850	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Wait Event Event 2	unsigned	851	RUI / Modbus
Profile Management	Profiling Page	Step 18 - Wait For Process	IEEE Float	852	RUI / Modbus
Profile Management	Profiling Page	Step 19 - End Type	unsigned	876	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Event Output 1	unsigned	868	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Event Output 2	unsigned	869	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Hours	unsigned	863	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Jump Count	unsigned	875	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Jump Step	unsigned	874	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Minutes	unsigned	864	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Rate	IEEE Float	866	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Seconds	unsigned	865	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Step Type	unsigned	860	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Target Set Point	IEEE Float	861	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Wait Event Event 1	unsigned	870	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Wait Event Event 2	unsigned	871	RUI / Modbus
Profile Management	Profiling Page	Step 19 - Wait For Process	IEEE Float	872	RUI / Modbus
Profile Management	Profiling Page	Step 20 - End Type	unsigned	896	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Event Output 1	unsigned	888	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Event Output 2	unsigned	889	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Hours	unsigned	883	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Jump Count	unsigned	895	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Jump Step	unsigned	894	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Minutes	unsigned	884	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Rate	IEEE Float	886	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Seconds	unsigned	885	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Step Type	unsigned	880	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Target Set Point	IEEE Float	881	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Wait Event Event 1	unsigned	890	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Wait Event Event 2	unsigned	891	RUI / Modbus
Profile Management	Profiling Page	Step 20 - Wait For Process	IEEE Float	892	RUI / Modbus
Profile Management	Profiling Page	Step 21 - End Type	unsigned	916	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Event Output 1	unsigned	908	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Event Output 2	unsigned	909	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Hours	unsigned	903	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Jump Count	unsigned	915	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Jump Step	unsigned	914	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Minutes	unsigned	904	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Rate	IEEE Float	906	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Seconds	unsigned	905	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Step Type	unsigned	900	RUI / Modbus

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Profile Management	Profiling Page	Step 21 - Target Set Point	IEEE Float	901	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Wait Event Event 1	unsigned	910	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Wait Event Event 2	unsigned	911	RUI / Modbus
Profile Management	Profiling Page	Step 21 - Wait For Process	IEEE Float	912	RUI / Modbus
Profile Management	Profiling Page	Step 22 - End Type	unsigned	936	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Event Output 1	unsigned	928	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Event Output 2	unsigned	929	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Hours	unsigned	923	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Jump Count	unsigned	935	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Jump Step	unsigned	934	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Minutes	unsigned	924	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Rate	IEEE Float	926	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Seconds	unsigned	925	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Step Type	unsigned	920	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Target Set Point	IEEE Float	921	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Wait Event Event 1	unsigned	930	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Wait Event Event 2	unsigned	931	RUI / Modbus
Profile Management	Profiling Page	Step 22 - Wait For Process	IEEE Float	932	RUI / Modbus
Profile Management	Profiling Page	Step 23 - End Type	unsigned	956	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Event Output 1	unsigned	948	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Event Output 2	unsigned	949	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Hours	unsigned	943	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Jump Count	unsigned	955	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Jump Step	unsigned	954	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Minutes	unsigned	944	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Rate	IEEE Float	946	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Seconds	unsigned	945	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Step Type	unsigned	940	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Target Set Point	IEEE Float	941	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Wait Event Event 1	unsigned	950	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Wait Event Event 2	unsigned	951	RUI / Modbus
Profile Management	Profiling Page	Step 23 - Wait For Process	IEEE Float	952	RUI / Modbus
Profile Management	Profiling Page	Step 24 - End Type	unsigned	976	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Event Output 1	unsigned	968	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Event Output 2	unsigned	969	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Hours	unsigned	963	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Jump Count	unsigned	975	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Jump Step	unsigned	974	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Minutes	unsigned	964	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Rate	IEEE Float	966	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Seconds	unsigned	965	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Step Type	unsigned	960	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Target Set Point	IEEE Float	961	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Wait Event Event 1	unsigned	970	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Wait Event Event 2	unsigned	971	RUI / Modbus
Profile Management	Profiling Page	Step 24 - Wait For Process	IEEE Float	972	RUI / Modbus
Profile Management	Profiling Page	Step 25 - End Type	unsigned	996	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Event Output 1	unsigned	988	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Event Output 2	unsigned	989	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Hours	unsigned	983	RUI / Modbus

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Profile Management	Profiling Page	Step 25 - Jump Count	unsigned	995	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Jump Step	unsigned	994	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Minutes	unsigned	984	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Rate	IEEE Float	986	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Seconds	unsigned	985	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Step Type	unsigned	980	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Target Set Point	IEEE Float	981	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Wait Event Event 1	unsigned	990	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Wait Event Event 2	unsigned	991	RUI / Modbus
Profile Management	Profiling Page	Step 25 - Wait For Process	IEEE Float	992	RUI / Modbus
Profile Management	Profiling Page	Step 26 - End Type	unsigned	1016	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Event Output 1	unsigned	1008	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Event Output 2	unsigned	1009	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Hours	unsigned	1003	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Jump Count	unsigned	1015	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Jump Step	unsigned	1014	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Minutes	unsigned	1004	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Rate	IEEE Float	1006	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Seconds	unsigned	1005	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Step Type	unsigned	1000	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Target Set Point	IEEE Float	1001	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Wait Event Event 1	unsigned	1010	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Wait Event Event 2	unsigned	1011	RUI / Modbus
Profile Management	Profiling Page	Step 26 - Wait For Process	IEEE Float	1012	RUI / Modbus
Profile Management	Profiling Page	Step 27 - End Type	unsigned	1036	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Event Output 1	unsigned	1028	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Event Output 2	unsigned	1029	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Hours	unsigned	1023	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Jump Count	unsigned	1035	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Jump Step	unsigned	1034	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Minutes	unsigned	1024	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Rate	IEEE Float	1026	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Seconds	unsigned	1025	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Step Type	unsigned	1020	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Target Set Point	IEEE Float	1021	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Wait Event Event 1	unsigned	1030	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Wait Event Event 2	unsigned	1031	RUI / Modbus
Profile Management	Profiling Page	Step 27 - Wait For Process	IEEE Float	1032	RUI / Modbus
Profile Management	Profiling Page	Step 28 - End Type	unsigned	1056	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Event Output 1	unsigned	1048	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Event Output 2	unsigned	1049	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Hours	unsigned	1043	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Jump Count	unsigned	1055	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Jump Step	unsigned	1054	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Minutes	unsigned	1044	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Rate	IEEE Float	1046	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Seconds	unsigned	1045	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Step Type	unsigned	1040	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Target Set Point	IEEE Float	1041	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Wait Event Event 1	unsigned	1050	RUI / Modbus

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Profile Management	Profiling Page	Step 28 - Wait Event Event 2	unsigned	1051	RUI / Modbus
Profile Management	Profiling Page	Step 28 - Wait For Process	IEEE Float	1052	RUI / Modbus
Profile Management	Profiling Page	Step 29 - End Type	unsigned	1076	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Event Output 1	unsigned	1068	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Event Output 2	unsigned	1069	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Hours	unsigned	1063	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Jump Count	unsigned	1075	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Jump Step	unsigned	1074	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Minutes	unsigned	1064	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Rate	IEEE Float	1066	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Seconds	unsigned	1065	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Step Type	unsigned	1060	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Target Set Point	IEEE Float	1061	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Wait Event Event 1	unsigned	1070	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Wait Event Event 2	unsigned	1071	RUI / Modbus
Profile Management	Profiling Page	Step 29 - Wait For Process	IEEE Float	1072	RUI / Modbus
Profile Management	Profiling Page	Step 30 - End Type	unsigned	1096	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Event Output 1	unsigned	1088	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Event Output 2	unsigned	1089	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Hours	unsigned	1083	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Jump Count	unsigned	1095	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Jump Step	unsigned	1094	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Minutes	unsigned	1084	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Rate	IEEE Float	1086	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Seconds	unsigned	1085	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Step Type	unsigned	1080	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Target Set Point	IEEE Float	1081	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Wait Event Event 1	unsigned	1090	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Wait Event Event 2	unsigned	1091	RUI / Modbus
Profile Management	Profiling Page	Step 30 - Wait For Process	IEEE Float	1092	RUI / Modbus
Profile Management	Profiling Page	Step 31 - End Type	unsigned	1116	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Event Output 1	unsigned	1108	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Event Output 2	unsigned	1109	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Hours	unsigned	1103	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Jump Count	unsigned	1115	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Jump Step	unsigned	1114	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Minutes	unsigned	1104	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Rate	IEEE Float	1106	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Seconds	unsigned	1105	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Step Type	unsigned	1100	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Target Set Point	IEEE Float	1101	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Wait Event Event 1	unsigned	1110	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Wait Event Event 2	unsigned	1111	RUI / Modbus
Profile Management	Profiling Page	Step 31 - Wait For Process	IEEE Float	1112	RUI / Modbus
Profile Management	Profiling Page	Step 32 - End Type	unsigned	1136	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Event Output 1	unsigned	1128	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Event Output 2	unsigned	1129	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Hours	unsigned	1123	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Jump Count	unsigned	1135	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Jump Step	unsigned	1134	RUI / Modbus

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Profile Management	Profiling Page	Step 32 - Minutes	unsigned	1124	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Rate	IEEE Float	1126	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Seconds	unsigned	1125	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Step Type	unsigned	1120	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Target Set Point	IEEE Float	1121	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Wait Event Event 1	unsigned	1130	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Wait Event Event 2	unsigned	1131	RUI / Modbus
Profile Management	Profiling Page	Step 32 - Wait For Process	IEEE Float	1132	RUI / Modbus
Profile Management	Profiling Page	Step 33 - End Type	unsigned	1156	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Event Output 1	unsigned	1148	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Event Output 2	unsigned	1149	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Hours	unsigned	1143	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Jump Count	unsigned	1155	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Jump Step	unsigned	1154	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Minutes	unsigned	1144	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Rate	IEEE Float	1146	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Seconds	unsigned	1145	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Step Type	unsigned	1140	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Target Set Point	IEEE Float	1141	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Wait Event Event 1	unsigned	1150	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Wait Event Event 2	unsigned	1151	RUI / Modbus
Profile Management	Profiling Page	Step 33 - Wait For Process	IEEE Float	1152	RUI / Modbus
Profile Management	Profiling Page	Step 34 - End Type	unsigned	1176	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Event Output 1	unsigned	1168	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Event Output 2	unsigned	1169	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Hours	unsigned	1163	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Jump Count	unsigned	1175	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Jump Step	unsigned	1174	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Minutes	unsigned	1164	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Rate	IEEE Float	1166	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Seconds	unsigned	1165	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Step Type	unsigned	1160	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Target Set Point	IEEE Float	1161	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Wait Event Event 1	unsigned	1170	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Wait Event Event 2	unsigned	1171	RUI / Modbus
Profile Management	Profiling Page	Step 34 - Wait For Process	IEEE Float	1172	RUI / Modbus
Profile Management	Profiling Page	Step 35 - End Type	unsigned	1196	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Event Output 1	unsigned	1188	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Event Output 2	unsigned	1189	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Hours	unsigned	1183	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Jump Count	unsigned	1195	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Jump Step	unsigned	1194	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Minutes	unsigned	1184	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Rate	IEEE Float	1186	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Seconds	unsigned	1185	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Step Type	unsigned	1180	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Target Set Point	IEEE Float	1181	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Wait Event Event 1	unsigned	1190	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Wait Event Event 2	unsigned	1191	RUI / Modbus
Profile Management	Profiling Page	Step 35 - Wait For Process	IEEE Float	1192	RUI / Modbus

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Profile Management	Profiling Page	Step 36 - Event Output 1	unsigned	1208	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Event Output 2	unsigned	1209	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Hours	unsigned	1203	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Jump Count	unsigned	1215	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Jump Step	unsigned	1214	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Minutes	unsigned	1204	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Rate	IEEE Float	1206	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Seconds	unsigned	1205	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Step Type	unsigned	1200	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Target Set Point	IEEE Float	1201	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Wait Event Event 1	unsigned	1210	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Wait Event Event 2	unsigned	1211	RUI / Modbus
Profile Management	Profiling Page	Step 36 - Wait For Process	IEEE Float	1212	RUI / Modbus
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Profile Management	Profiling Page	Step 37 - Event Output 1	unsigned	1228	RUI / Modbus
Profile Management	Profiling Page	Step 37 - Event Output 2	unsigned	1229	RUI / Modbus
Profile Management	Profiling Page	Step 37 - Hours	unsigned	1223	RUI / Modbus
Profile Management	Profiling Page	Step 37 - Jump Count	unsigned	1235	RUI / Modbus
Profile Management	Profiling Page	Step 37 - Jump Step	unsigned	1234	RUI / Modbus
Profile Management	Profiling Page	Step 37 - Minutes	unsigned	1224	RUI / Modbus
Profile Management	Profiling Page	Step 37 - Rate	IEEE Float	1226	RUI / Modbus
Profile Management	Profiling Page	Step 37 - Seconds	unsigned	1225	RUI / Modbus
Profile Management	Profiling Page	Step 37 - Step Type	unsigned	1220	RUI / Modbus
Profile Management	Profiling Page	Step 37 - Target Set Point	IEEE Float	1221	RUI / Modbus
Profile Management	Profiling Page	Step 37 - Wait Event Event 1	unsigned	1230	RUI / Modbus
Profile Management	Profiling Page	Step 37 - Wait Event Event 2	unsigned	1231	RUI / Modbus
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Profile Management	Profiling Page	Step 38 - Hours	unsigned	1243	RUI / Modbus
Profile Management	Profiling Page	Step 38 - Jump Count	unsigned	1255	RUI / Modbus
Profile Management	Profiling Page	Step 38 - Jump Step	unsigned	1254	RUI / Modbus
Profile Management	Profiling Page	Step 38 - Minutes	unsigned	1244	RUI / Modbus
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Profile Management	Profiling Page	Step 38 - Seconds	unsigned	1245	RUI / Modbus
Profile Management	Profiling Page	Step 38 - Step Type	unsigned	1240	RUI / Modbus
Profile Management	Profiling Page	Step 38 - Target Set Point	IEEE Float	1241	RUI / Modbus
Profile Management	Profiling Page	Step 38 - Wait Event Event 1	unsigned	1250	RUI / Modbus
Profile Management	Profiling Page	Step 38 - Wait Event Event 2	unsigned	1251	RUI / Modbus
Profile Management	Profiling Page	Step 38 - Wait For Process	IEEE Float	1252	RUI / Modbus
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Profile Management	Profiling Page	Step 39 - Target Set Point	IEEE Float	1261	RUI / Modbus
Profile Management	Profiling Page	Step 39 - Wait Event Event 1	unsigned	1270	RUI / Modbus
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Profile Management	Profiling Page	Step 40 - Jump Step	unsigned	1294	RUI / Modbus
Profile Management	Profiling Page	Step 40 - Minutes	unsigned	1284	RUI / Modbus
Profile Management	Profiling Page	Step 40 - Rate	IEEE Float	1286	RUI / Modbus
Profile Management	Profiling Page	Step 40 - Seconds	unsigned	1285	RUI / Modbus
Profile Management	Profiling Page	Step 40 - Step Type	unsigned	1280	RUI / Modbus
Profile Management	Profiling Page	Step 40 - Target Set Point	IEEE Float	1281	RUI / Modbus
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Set Point Manager	Setup - Loop	Closed Loop Active Set Point	IEEE Float	203	Modbus only
Set Point Manager	Home Page	Closed Loop Set point	IEEE Float	21	RUI / Modbus
Set Point Manager	Setup - Loop	Loop Input Error Failure	unsigned	214	RUI / Modbus
Set Point Manager	Setup - Loop	Loop Manual Power	IEEE Float	211	RUI / Modbus
Set Point Manager	Setup - Loop	Closed Loop High Set Point	IEEE Float	197	RUI / Modbus
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Set Point Manager	Setup - Loop	Open Loop Low Set Point	IEEE Float	199	Modbus only
Set Point Manager	Home Page	Open Loop Set Point	IEEE Float	23	RUI / Modbus
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Set Point Manager	Operation - Monitor	Ramp Set Point	IEEE Float	217	Modbus only
Set Point Manager	Setup - Loop	User Action Failure	unsigned	213	Modbus only
Status	Operation - Monitor	Alarm 1 State	unsigned	29	Modbus only
Status	Operation - Monitor	Alarm 2 State	unsigned	30	Modbus only
Status	Operation - Monitor	Ambient Temperature	IEEE Float	34	Modbus only
Status	Operation - Analog Input	Analog Input 1 Process Value	IEEE Float	19	RUI / Modbus
Status	Operation - Monitor	Analog Input 2 Process Value	IEEE Float	25	RUI / Modbus
Status	Operation - Monitor	Control Loop Output Power	IEEE Float	27	Modbus only
Status	Operation - Current	Current Error	unsigned	40	RUI / Modbus
Status	Operation - Current	Current Read	IEEE Float	38	RUI / Modbus
Status	Operation - Monitor	Event 1 Status	unsigned	32	Modbus only
Status	Operation - Monitor	Event 2 Status	unsigned	33	Modbus only
Status	Operation - Monitor	Limit State	unsigned	31	Modbus only

Specifications

Line Voltage/Power
- 100 to 240V~ (ac), +10/-15 percent; (85-264V~ [ac]), 50/60 Hz, ±5 percent
- 24V≂ (ac/dc), +10/-15 percent; 50/60Hz, ±5 percent
- 12VA maximum power consumption without mechanical contactor in system
- 50VA maximum power consumption with mechanical contactor in system
- 140VA maximum power consumption with external contactor
- Data retention upon power failure via nonvolatile memory

Environment (See Derating Curves in Declaration of Conformity)
- -18 to 70°C (0 to 158°F) operating temperature
- -40 to 85°C (-40 to 185°F) storage temperature
- 0 to 90 percent RH, non-condensing

Accuracy
- Calibration accuracy and sensor conformity: ±0.1 percent of span, ±1°C @ the calibrated ambient temperature and rated line voltage
- Calibration ambient temperature: 25°C, ±3°C (77°F, ±5°F)
- Accuracy span: 540°C (1000°F) minimum
- Temperature stability: ±0.1°C/°C (±0.1°F/°F) rise in ambient maximum

Agency Approvals
- UL® 508 file E102269, cULus, CE, IP66/NEMA 4X (RUI), RoHS, W.E.E.E.

  Product is UL recognized when purchased as components. Product is UL listed when purchased as a complete assembly.
- CSA approved C22.2#14 file 158031
- Limit version features FM approval

Controller
- Microprocessor-based, user-selectable control modes
- PID module: Single universal input, 2 outputs
- Limit module: Single universal input, 2 outputs
- 2 additional digital input/outputs shared between PID and limit functions
- Control sampling rates: input 10 Hz, outputs 10 Hz
- Isolated EIA 485 Modbus™ serial communications

Wiring Termination Touch-Safe Terminals
- Input, power and controller output terminals touch safe removable 4 to 0.34 mm^2 (12 to 22 AWG), 7.0 lb-in. torque.
- Power load terminals 3.3 to 0.324 mm^2 (6 to 12 AWG) STR 90°C (194°F) copper conductor only, 3.96 Nm (35 lb-in) torque
- Temperature rating for line and lug loads 90°C (194°F)

Universal Input
- Thermocouple, grounded or ungrounded sensors
- RTD 2- or 3-wire, platinum, 100 Ω @ 0°C calibration to DIN curve (0.00385 Ω/Ω/°C)
- Process, 0 to 20 mA @ 100 Ω, or 0 to 10V⎓ (dc) @ 20 kΩ input impedance; scalable
- Inverse scaling
- >20 MΩ input impedance
- Maximum of 20 Ω source resistance
- 42V⎓ (dc) isolation voltage for input 1 to input 2

Digital Input
- Update rate 1 Hz
- Dry contact or dc voltage

DC voltage
- Maximum input 36V at 3 mA
- Minimum high state 3V at 0.25 mA
- Maximum low state 2V

Dry contact
- Maximum short circuit 13 mA
- Minimum open resistance 500 Ω
- Maximum closed resistance 100 Ω

Current Measurement
- Nominal operating frequency 50 to 60 Hz.
- Accuracy ±15% of displayed value
- Accuracy range 5 to 50 A
- Operating range 2 to 50 A

Digital Output
- Update rate 10 Hz
- Output voltage 24V, current limit 10 mA

Input Accuracy Span Ranges
Type J: 0 to 815°C or 32 to 1500°F
Type K: -200 to 1370°C or -328 to 2500°F
Type T: -200 to 400°C or -328 to 750°F
Type N: 0 to 1300°C or 32 to 2372°F
Type E: -200 to 800°C or -328 to 1470°F
Type C: 0 to 2315°C or 32 to 4200°F
Type D: 0 to 2315°C or 32 to 4200°F
Type PTII: 0 to 1395°C or 32 to 2543°F
Type R: 0 to 1760°C or 32 to 3200°F
Type S: 0 to 1760°C or 32 to 3200°F
Type B: 0 to 1816°C or 32 to 3300°F
RTD (DIN): -200 to 800°C or -328 to 1472°F
Process: -1999 to 9999 units

Output Hardware
- User selectable for heat-cool as on-off, P, PI, PD, PID, alarm or limit action.
- Output 1: SSR drive 20 to 28V⎓ (dc) low side open collector switch
- Output 2: Solid-state relay, Form A, 0.5 A @ 24V~ (ac) minimum, 264V~ (ac) maximum, opto-isolated, without contact suppression
- Output 4: Electromechanical relay. Form A, rated 2 A, 125VA, pilot duty, 120/240V~ (ac); 25VA, 24V~ (ac)
- Output 2: Electromechanical relay. Form A, rated 5 A, 125VA, pilot duty, 120/240V~ (ac); 25VA, 24V~ (ac)
- Output 3: Electromechanical relay. Form C, rated 5 A, 125VA, pilot duty, 120/240V~ (ac); 25VA, 24V~ (ac)

Weight:
- 40 A heat sink assembly only, 431 g (0.95 lb)
- 25 A heat sink assembly only, 340 g (0.75 lb)
- solid-state relay controller only, 177 g (0.39 lb)
- solid-state relay controller only with base without heat sink, 345g (0.76 lb)
- full system with 25 A heat sink, 1.134 kg (2.5 lb)

Basic Remote User Interface (RUI)

Operator Interface
- Dual 4-digit, 7-segment LED displays
- Forward, backward, up and down keys plus a customer programmable function key
- Isolated EIA 485 Modbus™ serial communications
- Typical display update rate 1Hz
- Agency approved to IP66/NEMA 4X

(indoor use only)

Line Voltage/Power
- 100 to 240V~ (ac), +10/-15 percent; (85 to 264V~ [ac]) 50/60 Hz, ±5 percent 6VA maximum
- 24V≂ (ac/dc), +10/-15 percent; 50/60 Hz, ±5 percent

Weight:
- 99.8 g (0.22 lb)

Note: These specifications are subject to change without prior notice.

Ordering Information

Ordering Information for EZ-ZONE™ ST Accessory Kit

Code Number **E Z K** __ - __ __ __ __ - __ __ __ __

Remote User Interface (RUI)

A	None
B	Basic 1/16 DIN

Power Supply Voltage for Remote User Interface (RUI)

A	None, if no RUI is being ordered
L	Low voltage 24 to 28V≂ (ac/dc)
H	Universal high voltage 100 to 240V≂ (ac/dc)

For Future Use

A	None

Custom Remote User Interface (RUI)

AA	None
XX	Custom options, consult factory

For Future Use

A	None

Central Communication Module

A	None

PC Based Software

AA	None

NOTE
Configurator PC software can be downloaded for free from the Watlow website (www.watlow.com).

Ordering Information for EZ-ZONE™ ST Replacement Base

Code Number **S T R T** - **B A S E** - __ __ __ __

Series ST Replacement Base

Integrated Mechanical Controller

0000	Compact base version (no space for mechanical contactor)
DPB1	Base housing with single-pole, 40 A Watlow contactor, 24V~ (ac) power supply
DPB2	Base housing with single-pole, 40 A Watlow contactor, 110/120V~ (ac) power supply
DPB3	Base housing with single-pole, 40 A Watlow contactor, 208/240V~ (ac) power supply
DPF1	Base housing with dual-pole, 40 A Watlow contactor, 24V~ (ac) power supply
DPF2	Base housing with dual-pole, 40 A Watlow contactor, 110/120V~ (ac) power supply
DPF3	Base housing with dual-pole, 40 A Watlow contactor, 208/240V~ (ac) power supply

Ordering Information for EZ-ZONE™ ST Replacement Heat Sink

Code Number	S	T	R	T	-	H	S	-	_	_	0	0	0	_

Series ST Replacement Heat Sink

Heat Sink Base Configuration (Integrated Mechanical Contactor)

AA	Heat sink for mounting to compact base with no mechanical contactor (ordered separately STRT-BASE-_ _ _ _)
CB	Heat sink for mounting to large base with integrated mechanical contactor (base and contactor ordered separately under STRT-BASE-_ _ _ _)

Heat Sink Amperage Rating

B	25 A
C	40 A

Ordering Information for EZ-ZONE™ ST Replacement Solid State Relays (SSRs)

0003-0214-0000	10 A and 25 A replacement (24 to 240V~ (ac) output)
0003-0215-0000	40 A and 50 A replacement (24 to 240V~ (ac) output)**
0802-0952-0000	90 A replacement (24 to 240V~ (ac) output)**
0003-0216-0000	24 A replacement (48 to 600V~ (ac) output)
0003-0217-0000	40 A replacement (48 to 600V~ (ac) output)
0802-0951-0000	90 A replacement (48 to 600V~ (ac) output)**

** EZ-ZONE ST rated for maximum 40 A

Ordering Information and Model Numbers for EZ-ZONE™ ST

EZ-ZONE™ ST
Integrated Thermal Loop Hybrid Control Switch System
Output 1 is dedicated to controlling the internal solid-state relay.

S T __ __ - __ __ __ __ - __ __ __ __

Output 2, Digital I/O and Current Measurement

K	0.5 A solid-state relay
B	0.5 A solid-state relay with 2 digital i/o points
P	0.5 A solid-state relay with current measurement
E	0.5 A solid-state relay with 2 digital i/o points and current measurement
H	5 A mechanical relay form A
D	5 A mechanical relay form A, 2 digital i/o points
J	5 A mechanical relay form A, current measurement
C	5 A mechanical relay form A, 2 digital i/o points, current measurement

Integrated Limit Controller 1 universal input and 2 outputs

A	None
L	Limit control module (output 3, 5 A, Form C mech. relay; out. 4, 2 A, Form A mech. relay)
B	Terminal block access to mechanical contactor coil contacts

Mechanical Contactor and Power Supply If the limit controller was ordered, the contactor will come internally connected to output 4 on the limit module. The contactor has external contacts available for daisy chaining to other branch circuit components.

AH	No contactor and universal high voltage power supply 100 to 240V≂ (ac/dc)
AL	No contactor and universal low voltage power supply 24 to 28V≂ (ac/dc)
B1	Single pole, 40 A Watlow contactor, 24V~ (ac) power supply
B2	Single pole, 40 A Watlow contactor, 110 / 120V~ (ac) power supply
B3	Single pole, 40 A Watlow contactor, 208 / 240V~ (ac) power supply
F1	Dual pole, 40 A Watlow contactor, 24V~ (ac) power supply
F2	Dual pole, 40 A Watlow contactor, 110 / 120V~ (ac) power supply
F3	Dual pole, 40 A Watlow contactor, 208 / 240V~ (ac) power supply

Communications

A	Standard software to connect to pc software, remote user interface (RUI) and other EZ-ZONE™ STs
M	Modbus™ RTU communication port to connect to non-ST products

Solid-State Relay

B	10 A, 24 to 240V~ (ac) output
C	25 A, 24 to 240V~ (ac) output
D	40 A, 24 to 240V~ (ac) output
*E	50 A, 24 to 240V~ (ac) output
*F	90 A, 48 to 240V~ (ac) output
G	25 A, 24 to 600V~ (ac) output
H	40 A, 48 to 600V~ (ac) output
*J	90 A, 24 to 600V~ (ac) output

*EZ-ZONE™ ST only rated for maximum 40 A.

Heat Sinks

A	None (no DIN-rail mount)
B	25 A (See Derating Curves in the Declaration of Conformity.)
C	40 A (See Derating Curves in the Declaration of Conformity.)

Firmware

A	Standard Watlow
P	Profile ramp and soak (4 profiles, 40 steps)
S	Custom

Customization (logo, parameters, hardware, firmware)

AA	Standard
XX	{letters to be determined, consult factory}

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Declaration of Conformity

Series EZ-ZONE™ ST Tower

Watlow Winona, Inc.
1241 Bundy Blvd.
Winona, MN 55987 USA

Declares that the following product:

Designation:	Series EZ-ZONE™ ST Tower
Model Numbers:	ST, followed by K, B, P, E, H, D, J or C, followed by A, L or B, followed by A, B or F, followed by L, H, 1, 2 or 3, followed by any letter or number, followed by A – H or J, followed by A, B or C, followed by any three numbers or letters.
Classification:	Temperature control, Installation Category II, Pollution degree 2
Rated Voltage and Frequency:	Control 100 to 240V~ (ac 50/60 Hz) or 24 to 28V≂ (ac 50/60 Hz or dc) Load 24 to 240V~ (ac 50/60 Hz) or 48 to 600V~ (ac 50/60 Hz)
Rated Power Consumption:	Control 12VA, Control with Contactor 50 VA, Control with external contactor 140 VA. Load Current 25 or 40 A depending upon heatsink. (see derating curve)

Meets the essential requirements of the following European Union Directives by using the relevant standards show below to indicate compliance.

89/336/EEC Electromagnetic Compatibility Directive

EN 61326	1997	A1:1998 A2:2002	Electrical equipment for measurement, control and laboratory use – EMC requirements (Industrial Immunity, Class A Emissions*). Not for use in a Class B environment without additional filtering.
EN 61000-4-2	1996	A1, 1998	Electrostatic Discharge Immunity
EN 61000-4-3	1997		Radiated Field Immunity
EN 61000-4-4	1995		Electrical Fast-Transient / Burst Immunity
EN 61000-4-5	1995	A1, 1996	Surge Immunity
EN 61000-4-6	1996		Conducted Immunity
EN 61000-4-8	1994	A1, 2001	Magnetic Field Immunity
EN 61000-4-11	1994		Voltage Dips, Short Interruptions and Voltage Variations Immunity
EN 61000-3-2	2000	ED.2.	Harmonic Current Emissions
EN 61000-3-3[2]	1995	A1:1998	Voltage Fluctuations and Flicker

*NOTE 1: Use of an external filter is required to comply with conducted emissions limits for load terminals. For 230V~ (ac) or less, use Watlow P/N 14-0019 or Crydom P/N 1F25 filters. For voltages up to 440V~ (ac) use Watlow P/N 14-0020 or Crydom P/N 3F20 filters.

*NOTE 2: A Line Impedance Stabilization Network (LISN) was used for conducted emissions measurements.

[2]NOTE 3: To comply with flicker requirements cycle time must be set greater than 4 seconds if Load Power is ≤ 16 A; or meet EN 61000-3-11 impedance requirements for load currents > 16 A.

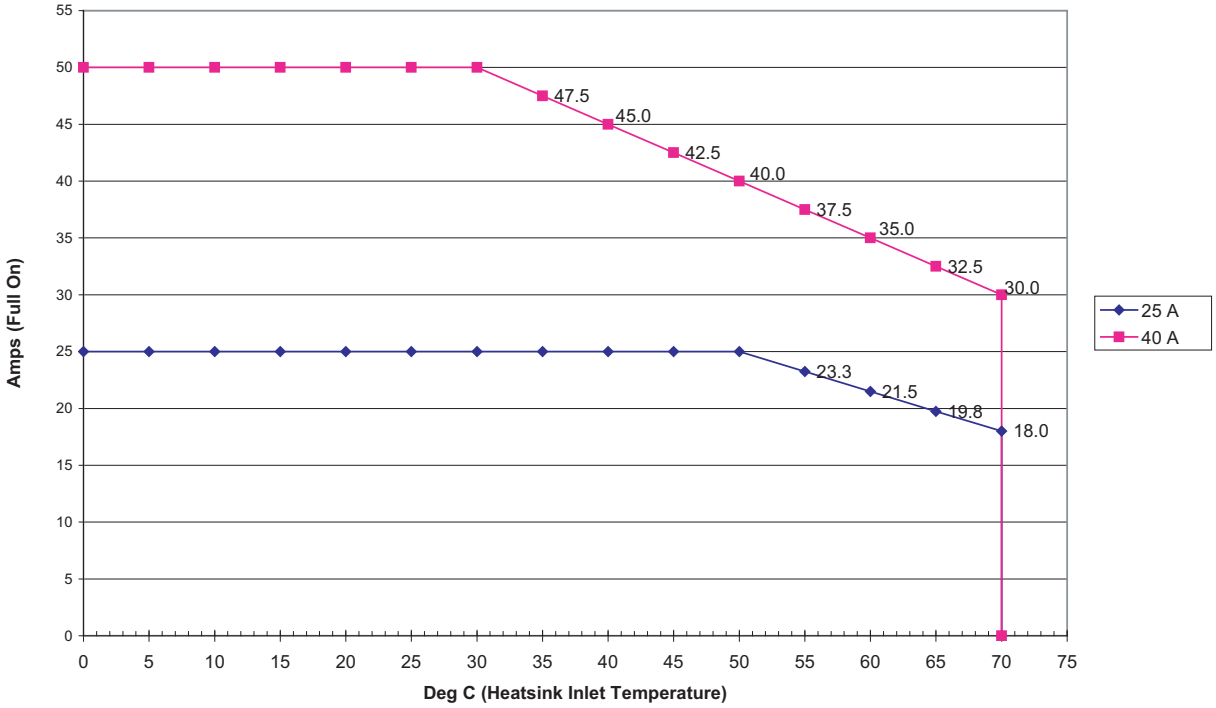
73/23/EEC Low-Voltage Directive

EN 61010-1	2001	Safety Requirements of electrical equipment for measurement, control and laboratory use. Part 1: General requirements

Compliant with 2002/95/EC RoHS Directive

2002/96/EC WEEE Directive Equipment Requires Recycling

Amperage/Temperature Derating Curves
EZ ZONE™ ST



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